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BOEING VERTOL CO PHILADELPHIA PA

CH-46 COMPOSITE ROTOR BLADE FLIGHT STRESS SURVEY DATA. VOLUME I--ETC(U)

1978 R AIELLO, J BENDO

N00019-75-C-0396

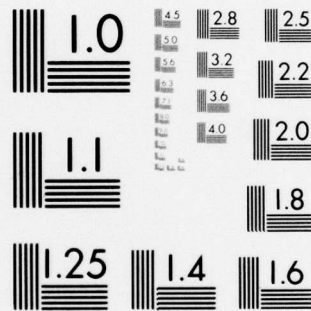
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UNCLASSIFIED D210-11168-3-VOL-2

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VOL-2



6 TITLE CH-46 COMPOSITE ROTOR BLADE FLIGHT STRESS
SURVEY DATA, PLOTTED FORWARD ROTOR BLADE ANGLES AND
FLAP LOADS. Volume II.

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MODEL CH-46 CONTRACT N00019-75-C-0396

ISSUE NO. _____ ISSUED TO: 15

10 R./Aiello
J./Bendo

11 1978

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APPROVED BY L. Marchinski/D. Hardy DATE 12-1-78
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ACTIVE SHEET RECORD

SHEET NUMBER	REV LTR	ADDED SHEETS				SHEET NUMBER	REV LTR	ADDED SHEETS			
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FORM 46283 (7/67)

ACTIVE SHEET RECORD											
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93				123				153			
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95				125				155			
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99				129				159			
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106				136				166			
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FORM 46268 (7/67)

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FORM 46263 (7/67)

PREPARED BY: J. Bendo
CHECKED BY:
DATE: 8/28/78

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NUMBER Vol. 2
REV LTR
MODEL NO.

ABSTRACT

This report volume presents plotted forward rotor blade angles and flap loads measured during the CH-46 Composite Rotor Blade Flight Stress Survey.

KEYWORDS

CH-46E
Composite
Rotor Blade
Flight Stress Survey
Alternating and Steady Loads

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REFERENCES

1. Vertol Report D210-11168-1 "CH-46 Composite Rotor Blade Flight Test Qualification Test Plan" March 30, 1977
2. Vertol Report D210-11168-2 "CH-46 Composite Rotor Blade Flight Test Report" May 15, 1978
3. Boeing Vertol Report D210-11168-3 Vol. 1 of 13, CH-46 Composite Rotor Blade Flight Stress Survey Data
4. Boeing Vertol Report D210-11168-3 Vol. 9 of 13, CH-46 Composite Rotor Blade Flight Stress Survey Data, Tabulated Forward Blade Angles and Loads

1. INTRODUCTION

A flight stress survey was conducted on a CH-46 helicopter with A02R1702 composite rotor blades. The test was conducted in accordance with Paragraphs 4.3.2 and 4.7 of Reference 1. General test description and pilot comments are included in Reference 2.

The tests were conducted at the Boeing Vertol Flight Test Facility at Ridley Township, Pennsylvania, during the period of June 1977 through November 1977.

2. SUMMARY

A flight stress survey and structural demonstration was conducted on the #1 CH-46E Helicopter, BuNo. 153372 (S/N 2268).

The components under test were the A02R1702 composite rotor blades and the A02R1710 blade socket.

This volume contains measured steady and alternating forward rotor blade angles and flap loads plotted versus true airspeed. The same data is tabulated in Volume 9. ↗

3. DATA PRESENTATION

This report contains measured steady and alternating forward blade angles and flap loads. The data is presented as plots versus true airspeed. The steady and alternating values are plotted separately and appear together as two plots per page for various level flight and maneuver conditions. The angles and load levels shown represent the maximum alternating angle or load cycle occurring during the particular flight condition. This same data is tabulated in Volume 9.

Detailed flight condition parameters and a complete tabulated summary of maneuvers for each flight can be found in Volume 1 of this report.

3.1 Gage Identification and Index

Data plot indexing, strain gage identification and instrumentation code information for data presented in this volume are as follows:

<u>DATA CODE</u>		<u>MEASUREMENT</u>		<u>DATA PLOT PAGE #</u>
<u>ACTIVE</u>	<u>SPARE</u>	<u>NAME</u>	<u>UNITS</u>	
31010	-	Fwd Blade Flap Angle	(Deg.)	21
31020	-	Fwd Blade Lead Lag Angle	(Deg.)	55
31030	-	Fwd Blade Pitch Angle	(Deg.)	89
41150	61150	Fwd Blade Extension Link Flap Bending	(IN-LB)	110
41710	61710	Fwd Blade Flap Bending Sta. 50.	(IN-LB)	149
41720	61720	Fwd Blade Flap Bending Sta. 88.	(IN-LB)	183
41730	61730	Fwd Blade Flap Bending Sta. 136.	(IN-LB)	217
41740	61740	Fwd Blade Flap Bending Sta. 240.	(IN-LB)	251
41750	61750	Fwd Blade Flap Bending Sta. 275.	(IN-LB)	285

- NOTES:
1. A complete description of the instrumentation for this stress survey can be found in Volume 1.
 2. A flight by flight summary of operative gages can be found in Reference 2.
 3. Spare gages were utilized when the active gages proved inoperable.

3.2 Sign Convention

The following table summarizes the sign convention adhered to for the gages presented in this volume.

<u>GAGE MEASUREMENT NAME</u>	<u>(+) POLARITY CONDITION</u>
Fwd Blade Flap Angle	Blade Up
Fwd Blade Lead Lag Angle	Blade Lagging
Fwd Blade Pitch Angle	L.E. Up
Fwd Blade Extension Link Flap Bending	Blade Up
Fwd Blade Flap Bending Sta. 50.	Blade Up
Fwd Blade Flap Bending Sta. 88.	Blade Up
Fwd Blade Flap Bending Sta. 136.	Blade Up
Fwd Blade Flap Bending Sta. 240.	Blade Up
Fwd Blade Flap Bending Sta. 275.	Blade Up

3.3 Plot Format

The data plots have been grouped by common flight conditions and maneuvers and are presented in the order outlined by the data plot format table included on the next page.

For identification of data plots the plot code number in the right hand column of the table is printed on each corresponding plot chart.

Please note that many symbols are used more than once.

PLOT FORMAT

GROSS WEIGHT LBS.	C.G. IN.	HD FT.	RPM	CONDITION	PLOT CODE NO.
20800 ↓	22.4"Fwd ↓	2000	264	Level Flt.	- 1
		14000		Level Flt.	- 2
		All		Pullups (PWR ON&OFF), P.P.D. Rec.	-11
		↓		Turns (PWR ON&OFF)	-15
		↓		Control Rev.'s (PWR ON)	-19
		↓		Control Rev.'s (PWR OFF), Flares	-23
		↓		P.P.D.'s, Autorotation	-27
	9.7"Aft ↓	2000	264	Level Flt.	- 3
		6000		Level Flt.	- 4
		14000		Level Flt.	- 5
		6000		Level Flt.	-10
		All		Pullups (PWR ON&OFF), P.P.D. Rec.	-12
		↓		Turns (PWR ON&OFF)	-16
		↓		Control Rev.'s (PWR ON)	-20
24300 ↓	13.2"Fwd ↓	2000	248	Control Rev.'s (PWR OFF), Spiral Desc., Flares	-24
		8000		P.P.D.'s Autorotation	-28
		All		Level Flt.	- 6
		↓		Level Flt.	- 7
		↓		Pullups (PWR ON&OFF)	-13
		↓		Turns (PWR ON&OFF)	-17
		↓		Control Rev.'s (PWR ON)	-21
				Spiral Descent, Flares	-25
				P.P.D.'s, P.P.D. Rec., Autorotation	-29

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 CHECKED BY:
 DATE: 9/5/78

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Plot Format (Continued)

GROSS WEIGHT LBS.	C.G. IN.	HD FT.	RPM	CONDITION	PLOT CODE NO.
24300 ↓	4.4"Fwd ↓	2000	264 ↓	Level Flt.	- 8
		8000		Level Flt.	- 9
		All ↓		Pullups (PWR ON&OFF)	-14
				Turns (PWR ON&OFF)	-18
	1.5"Aft	2000		Control Rev.'s (PWR ON)	-22
				Spiral Descent, Flares	-26
				P.P.D.'s, Autorotation	-30
				Level Flight (External Cargo)	-35

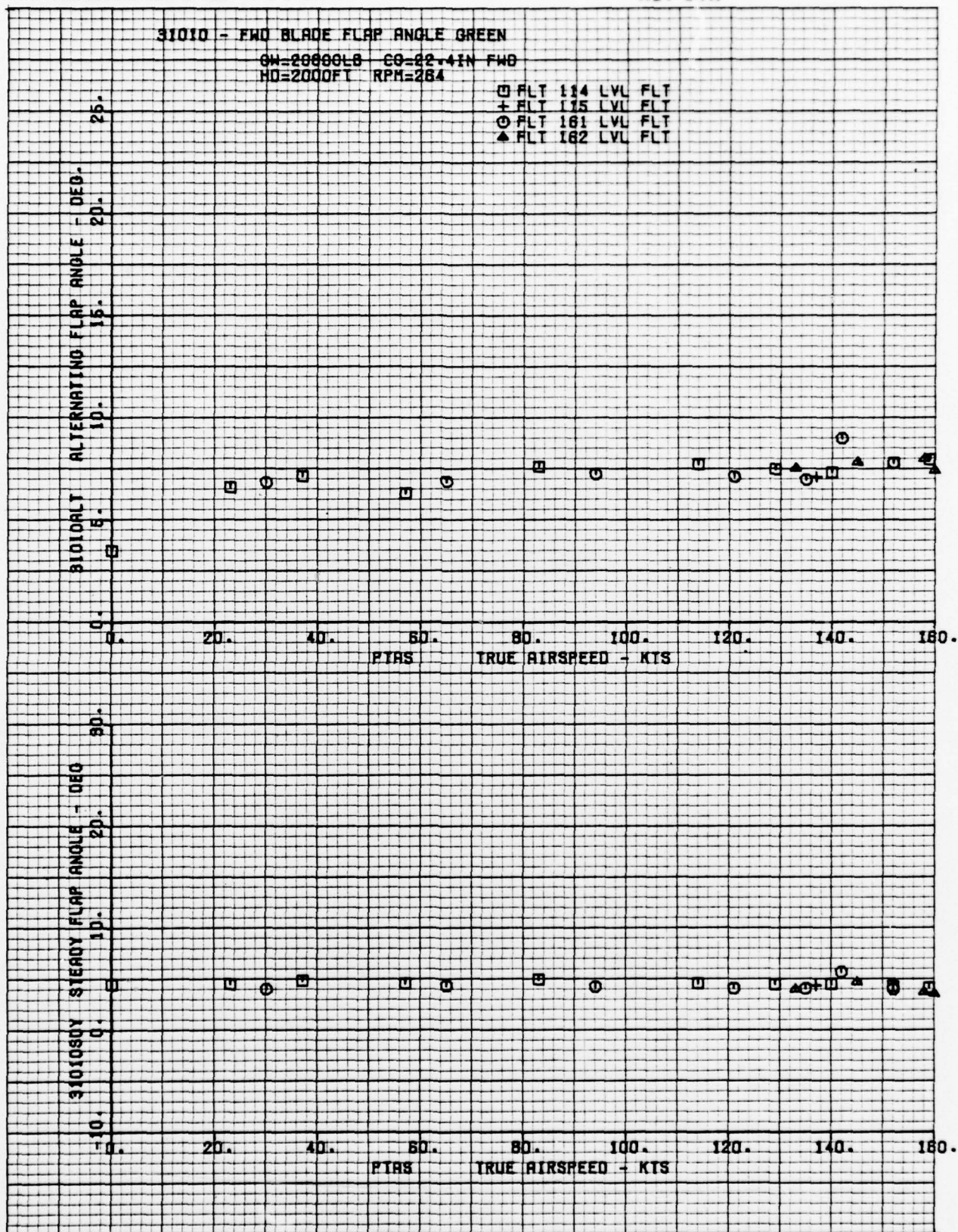
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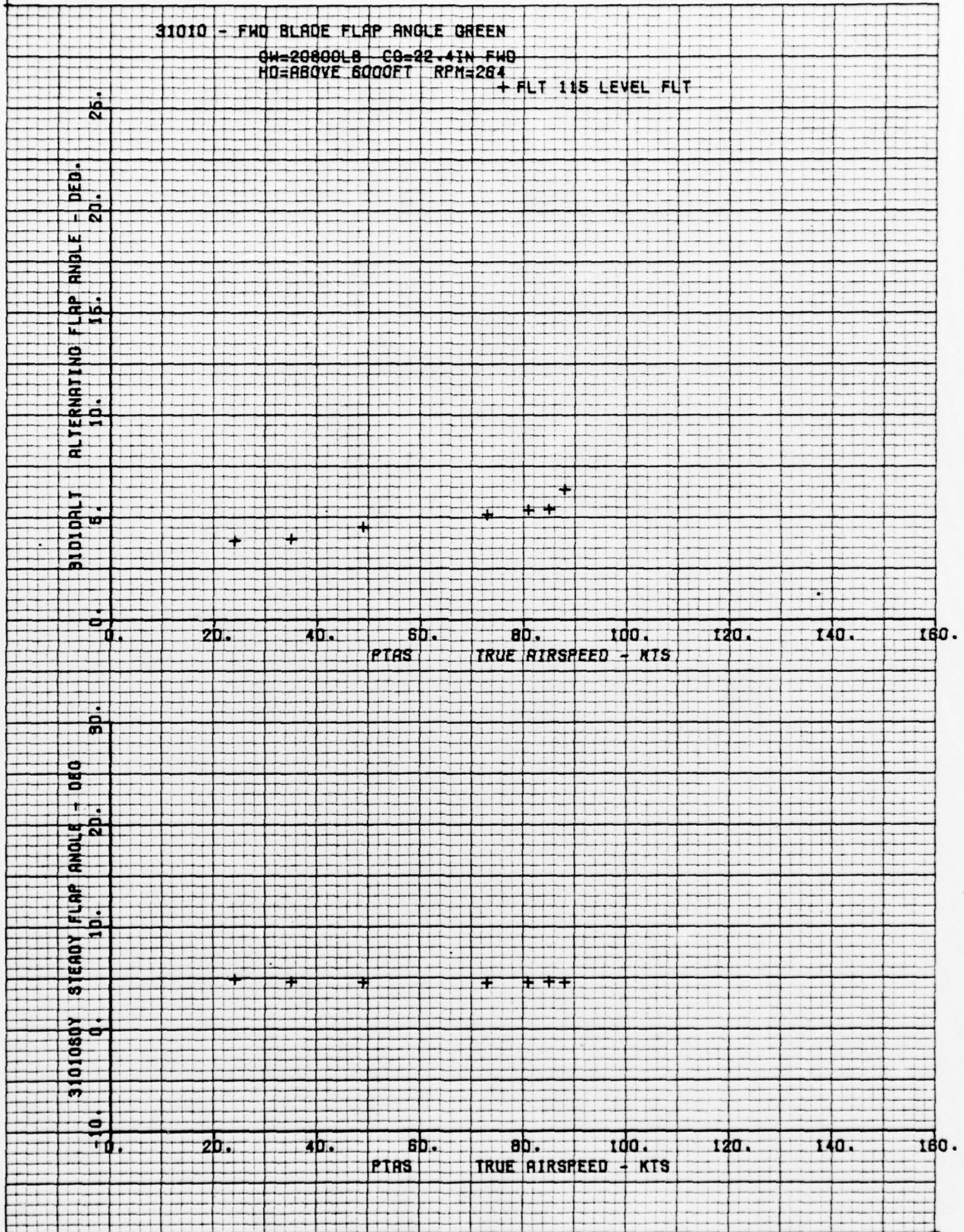
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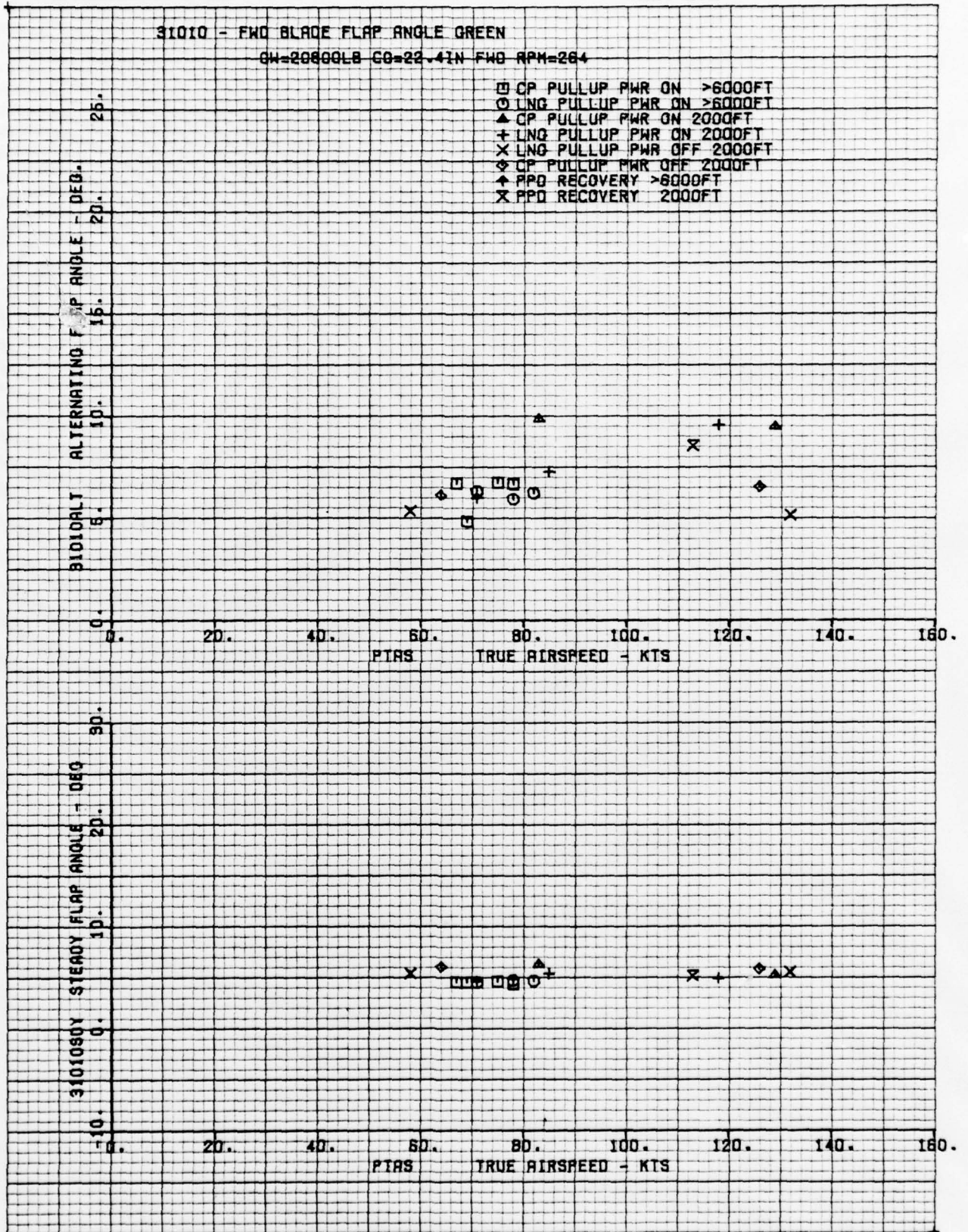
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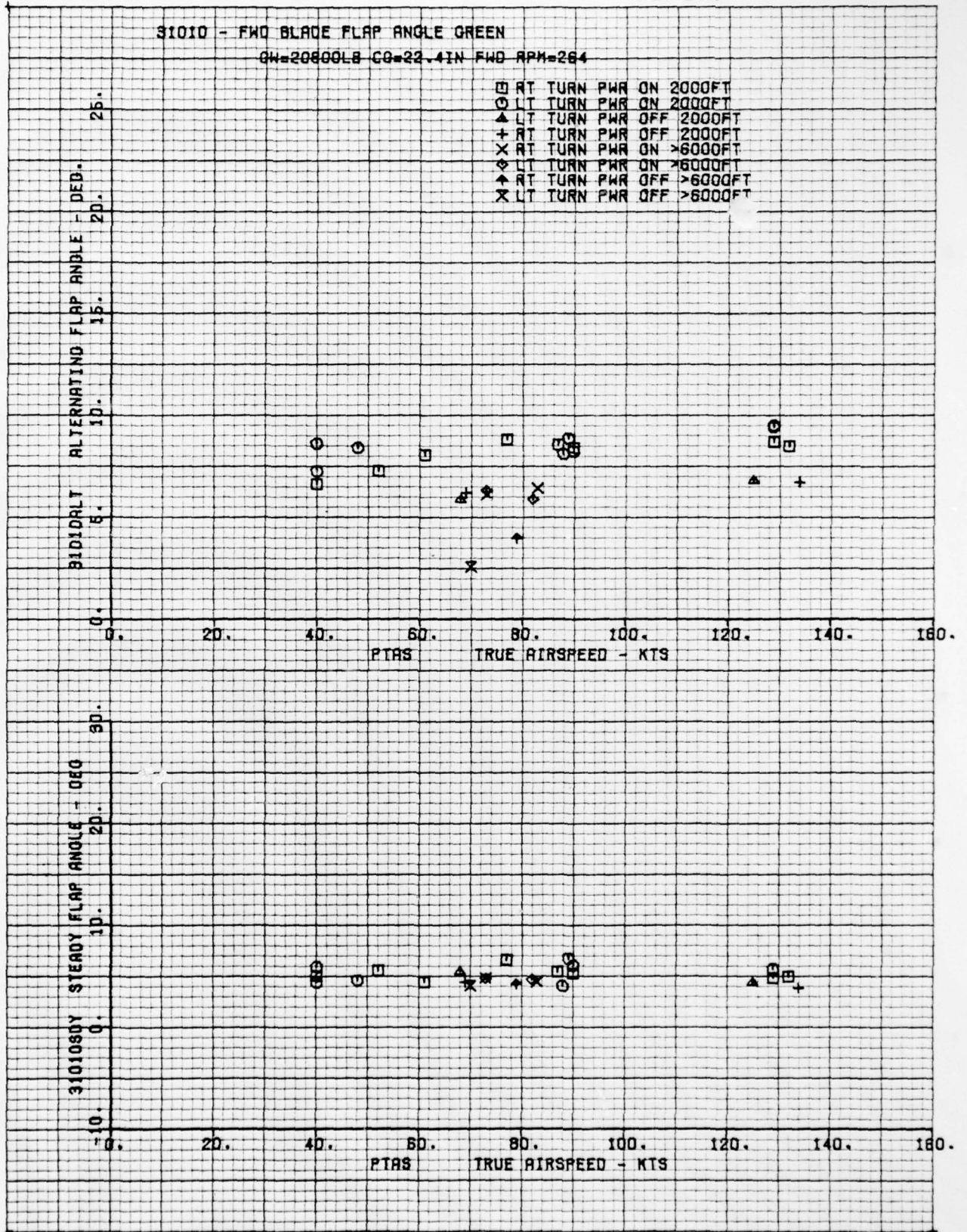
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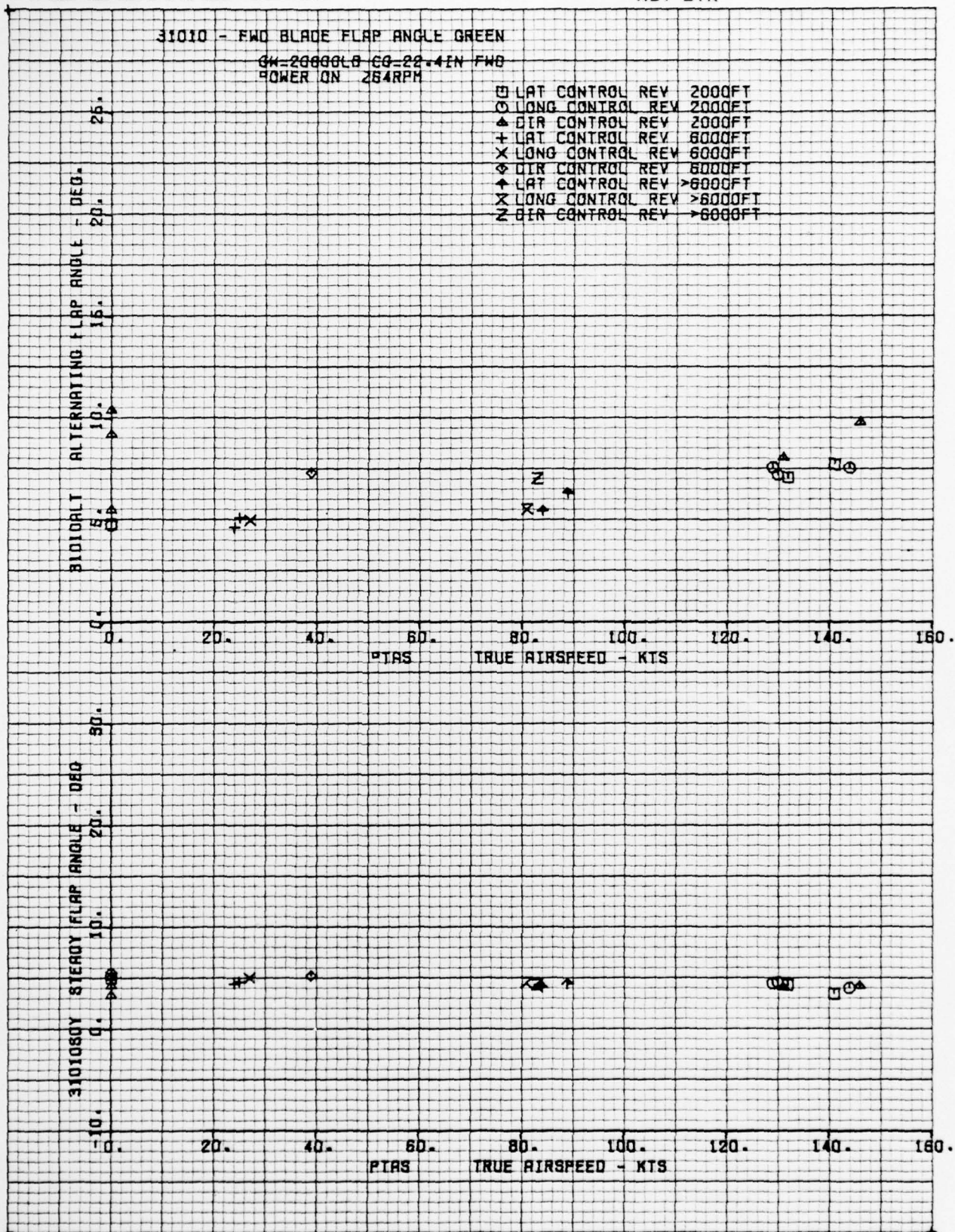
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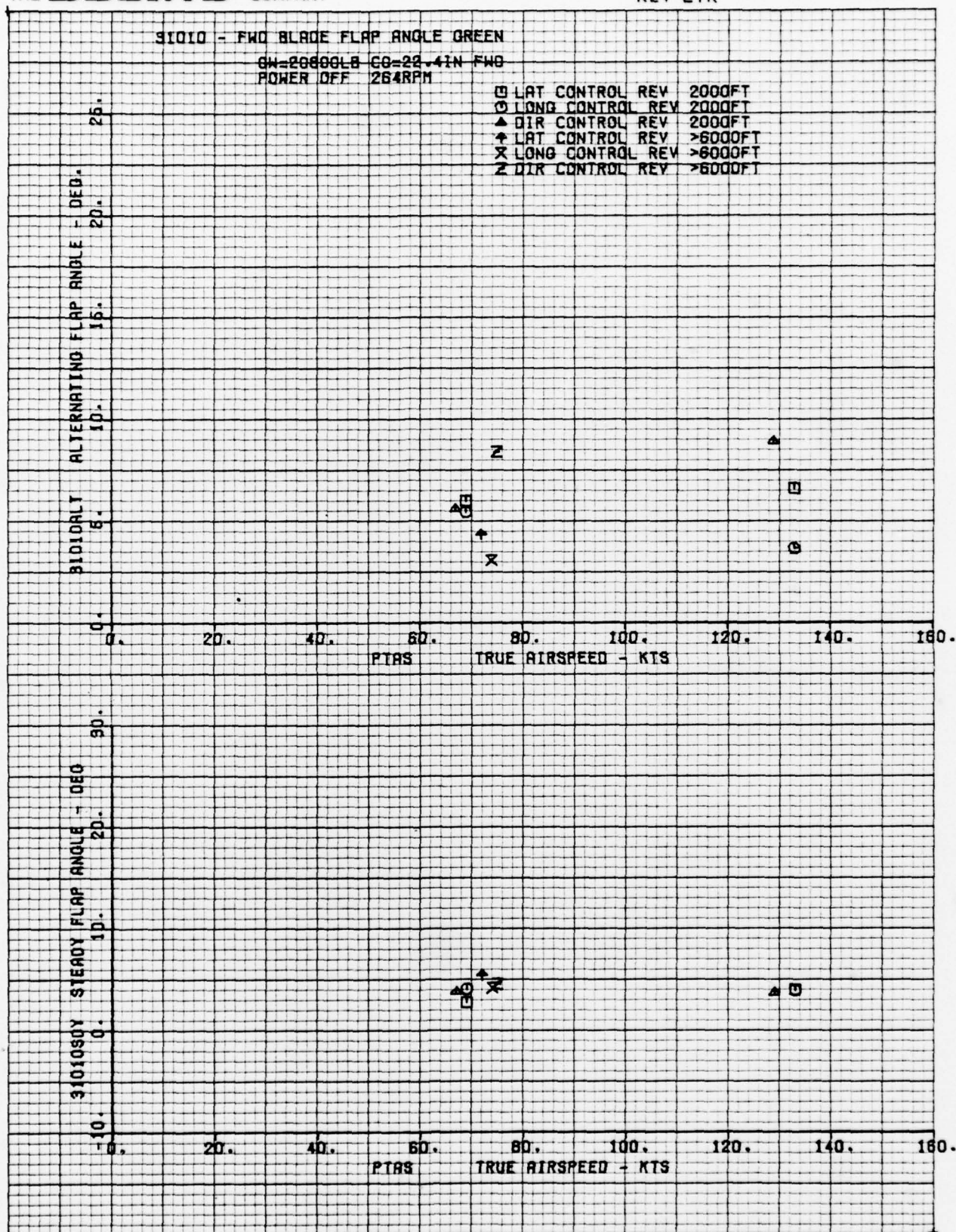


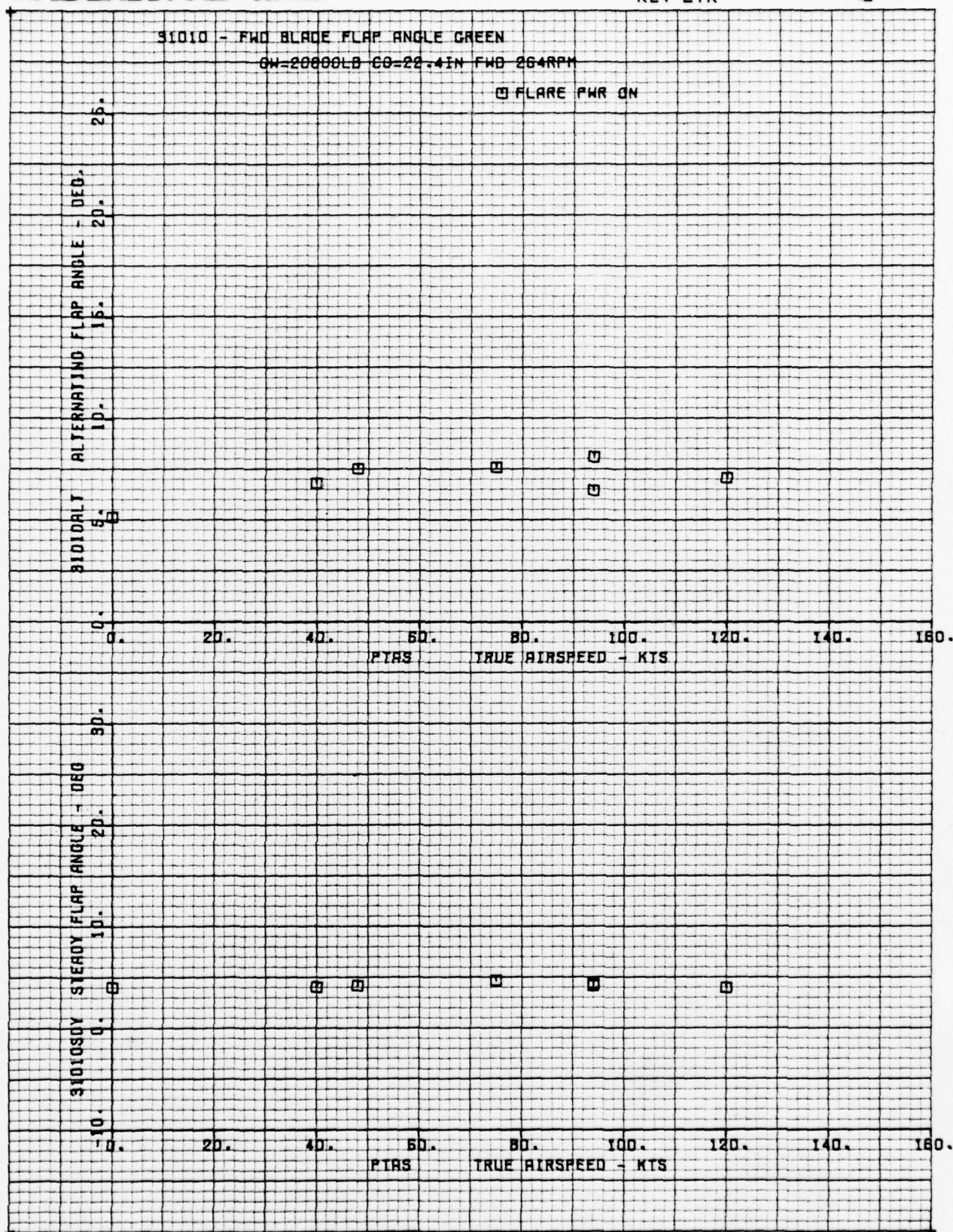


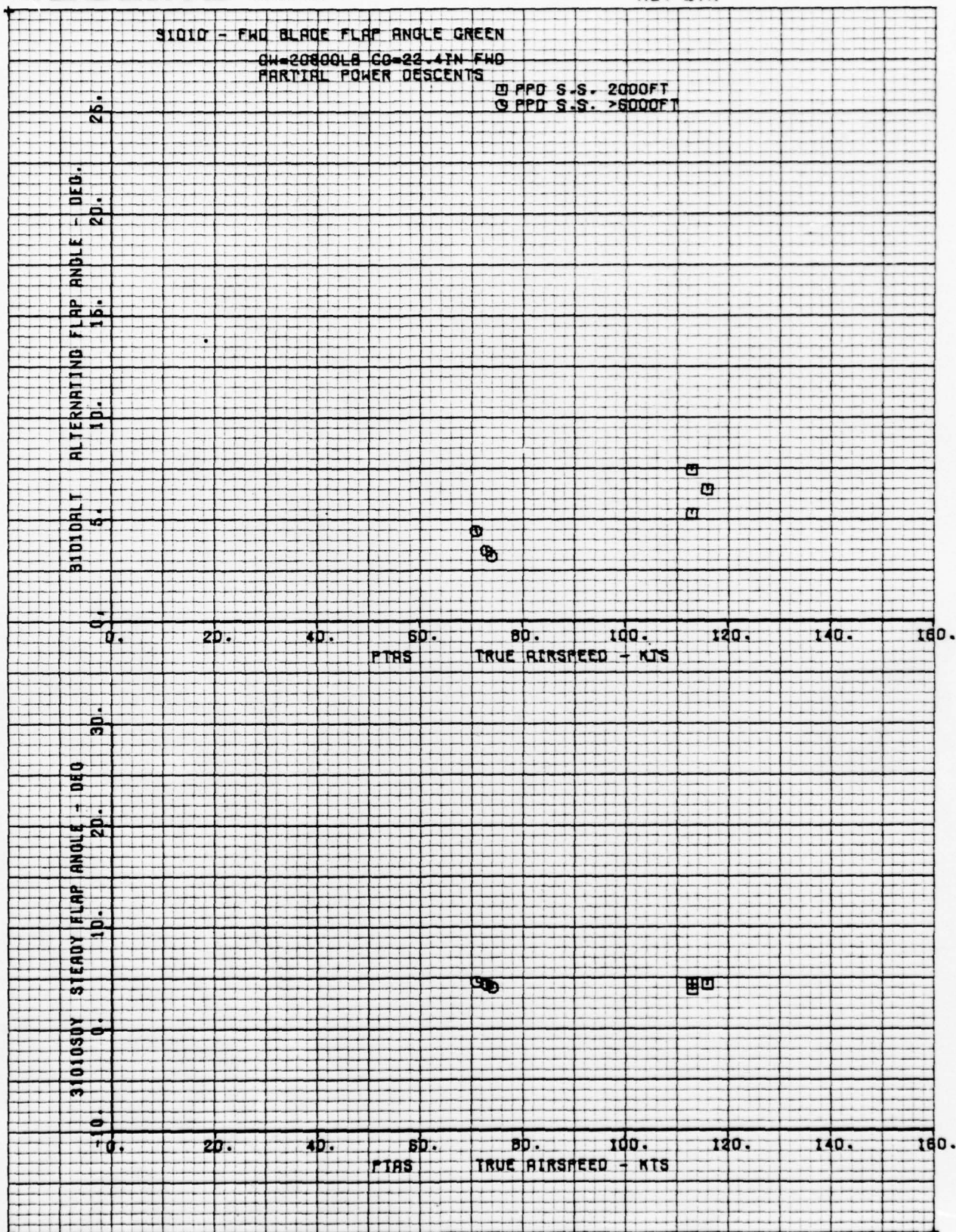


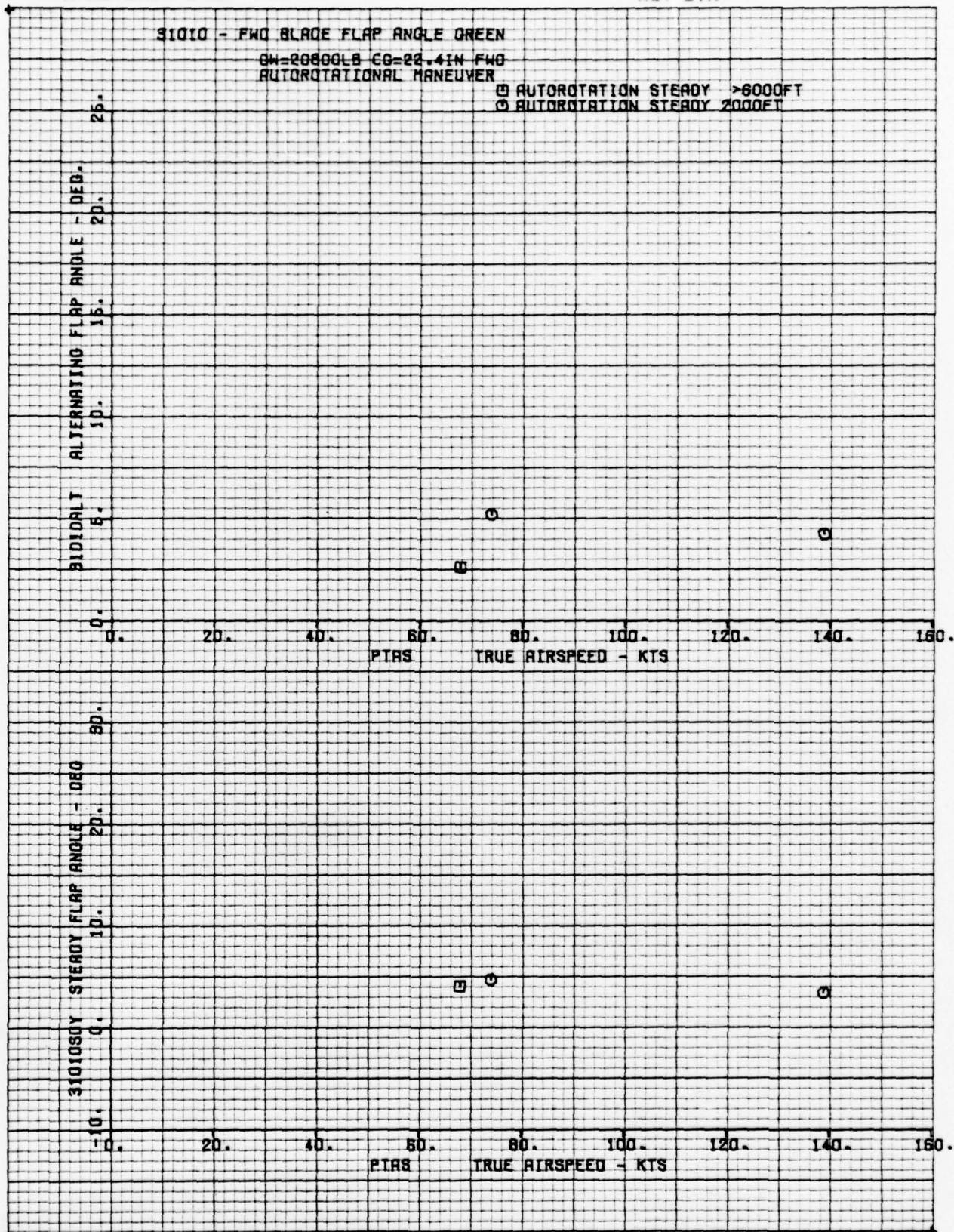


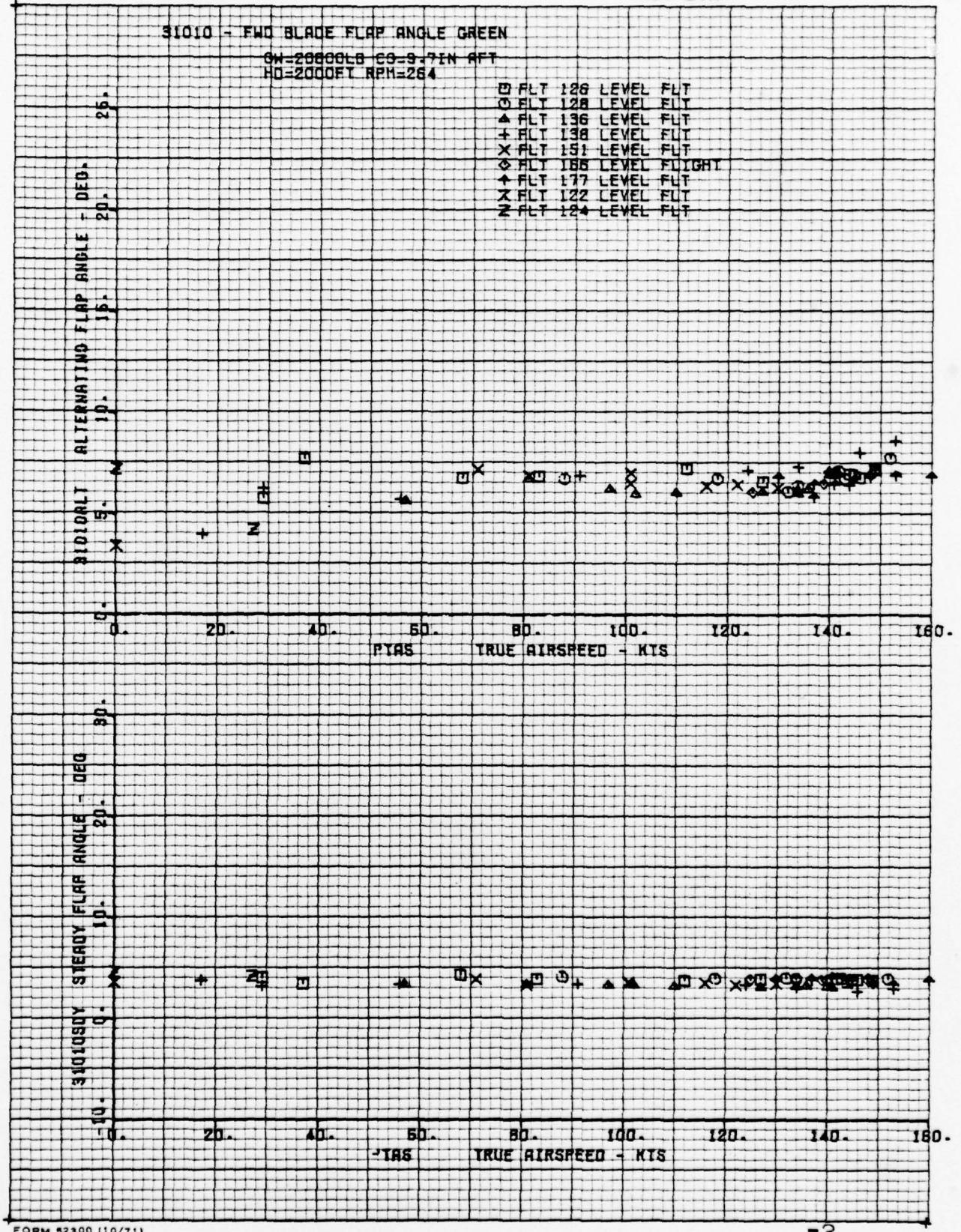


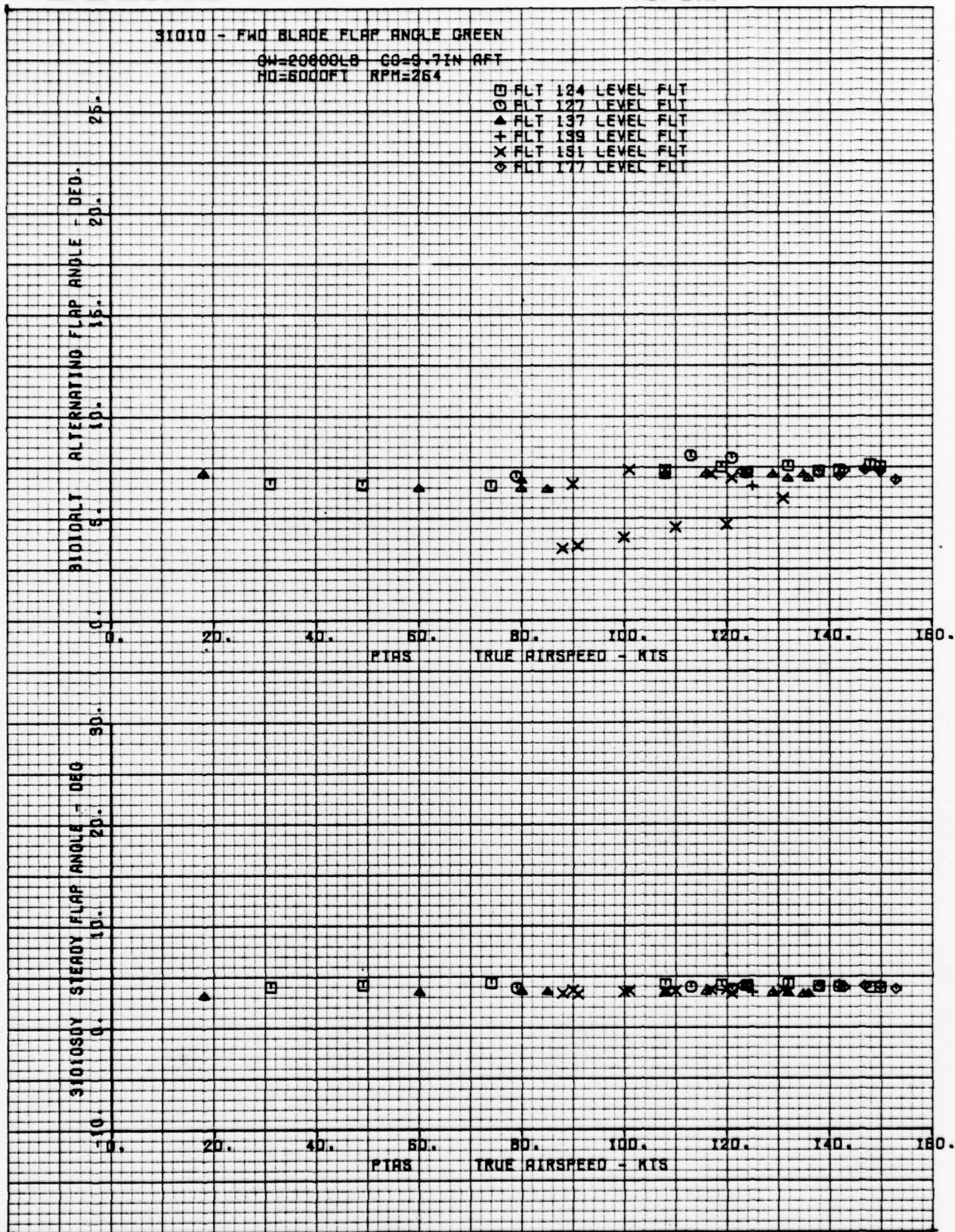


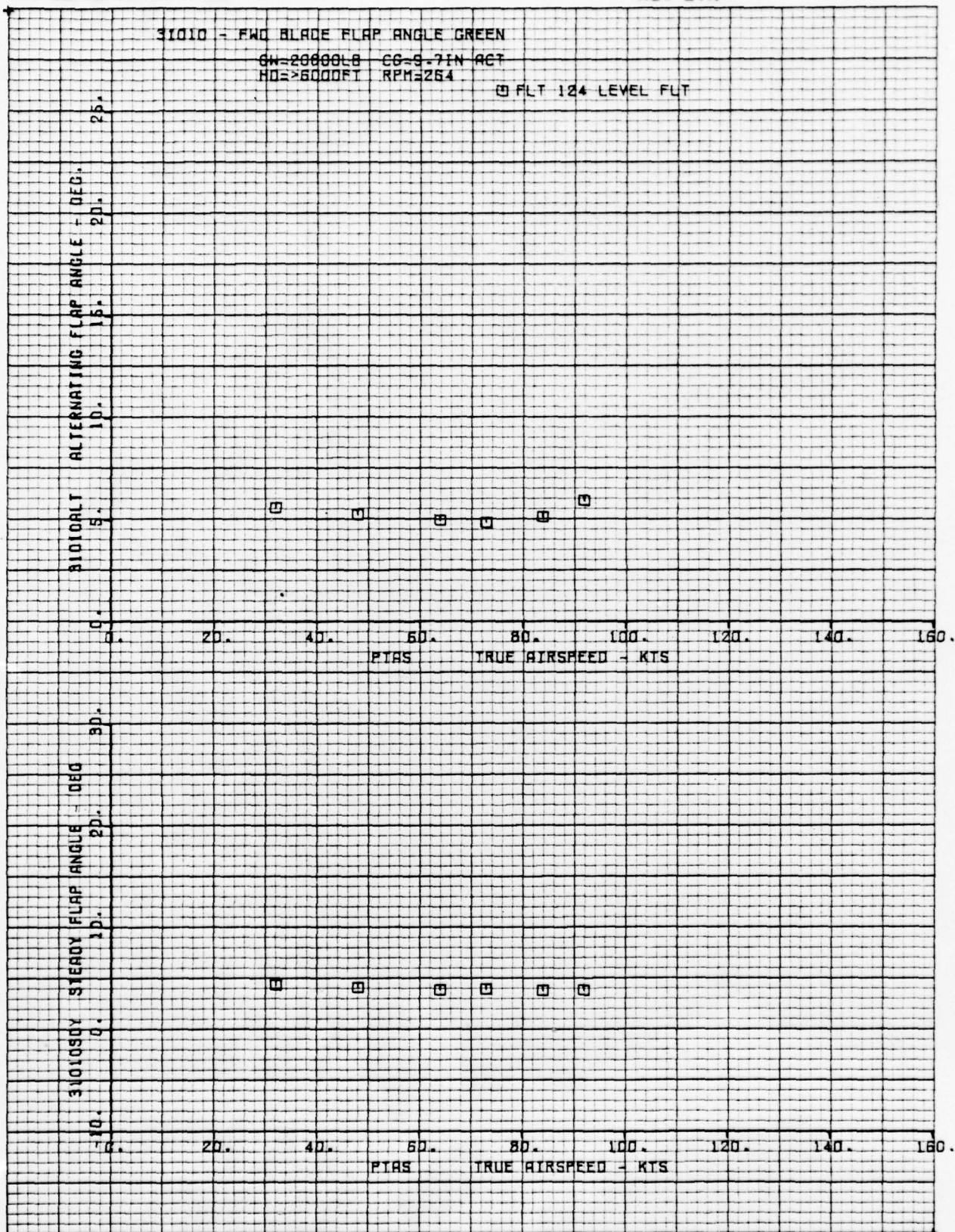


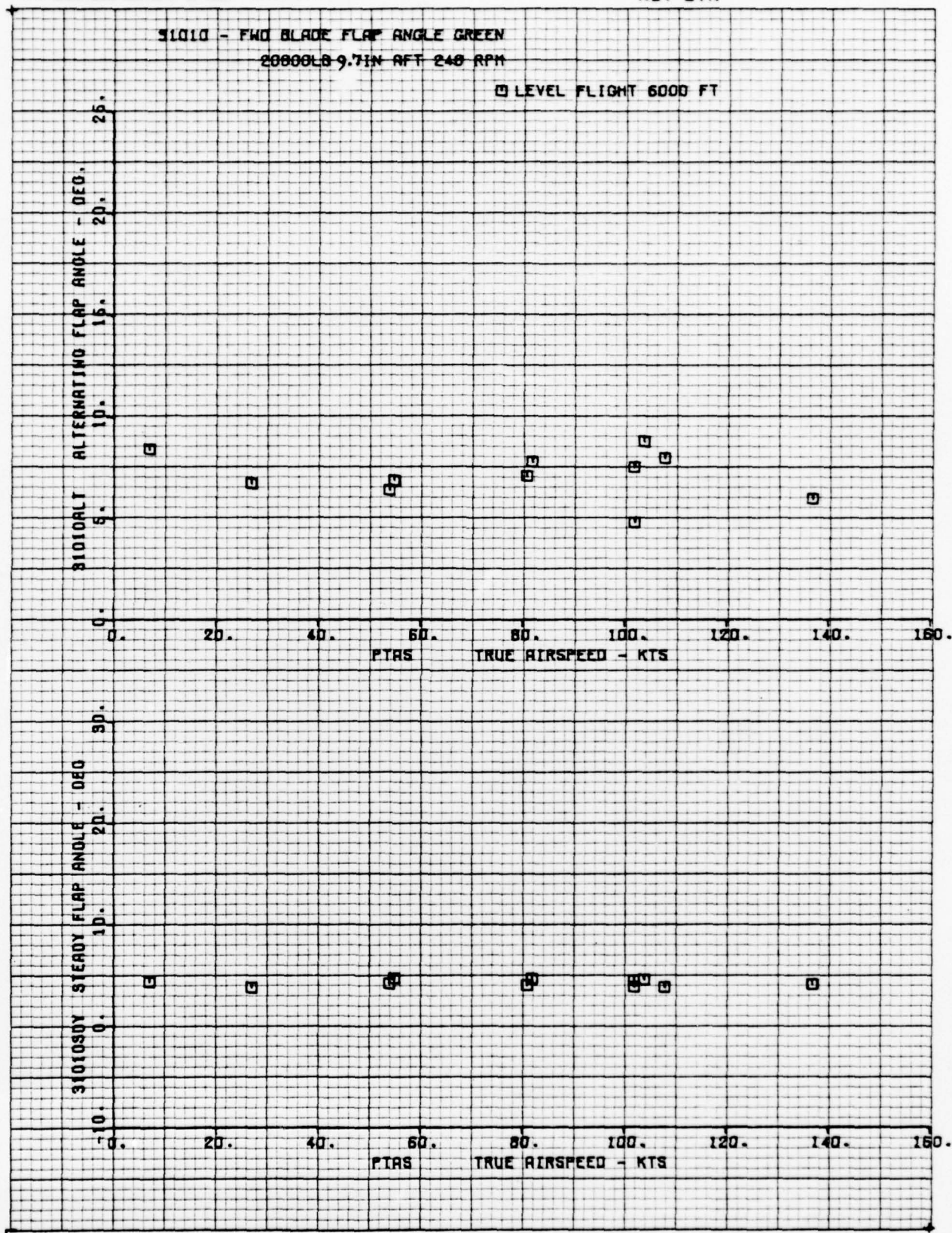


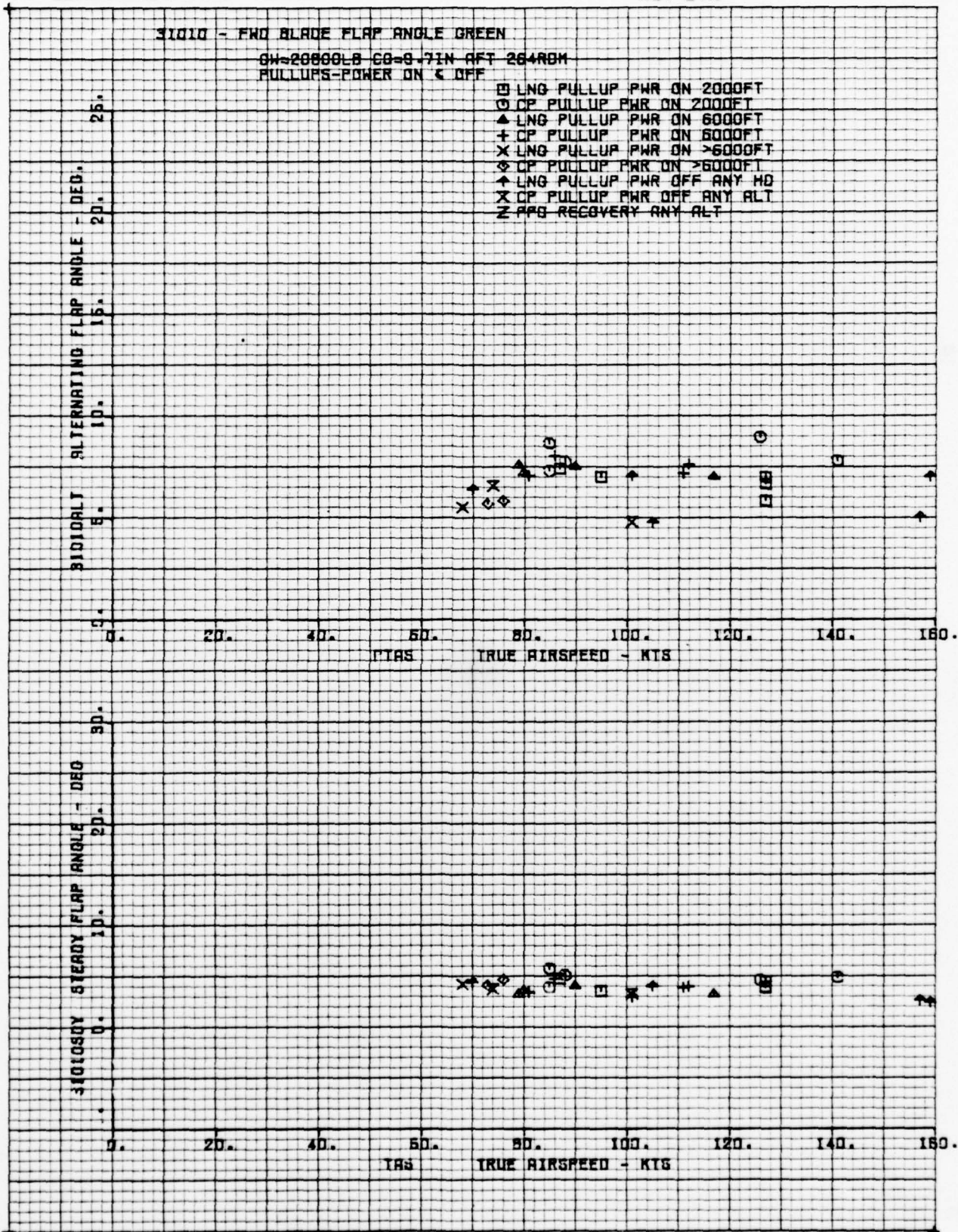


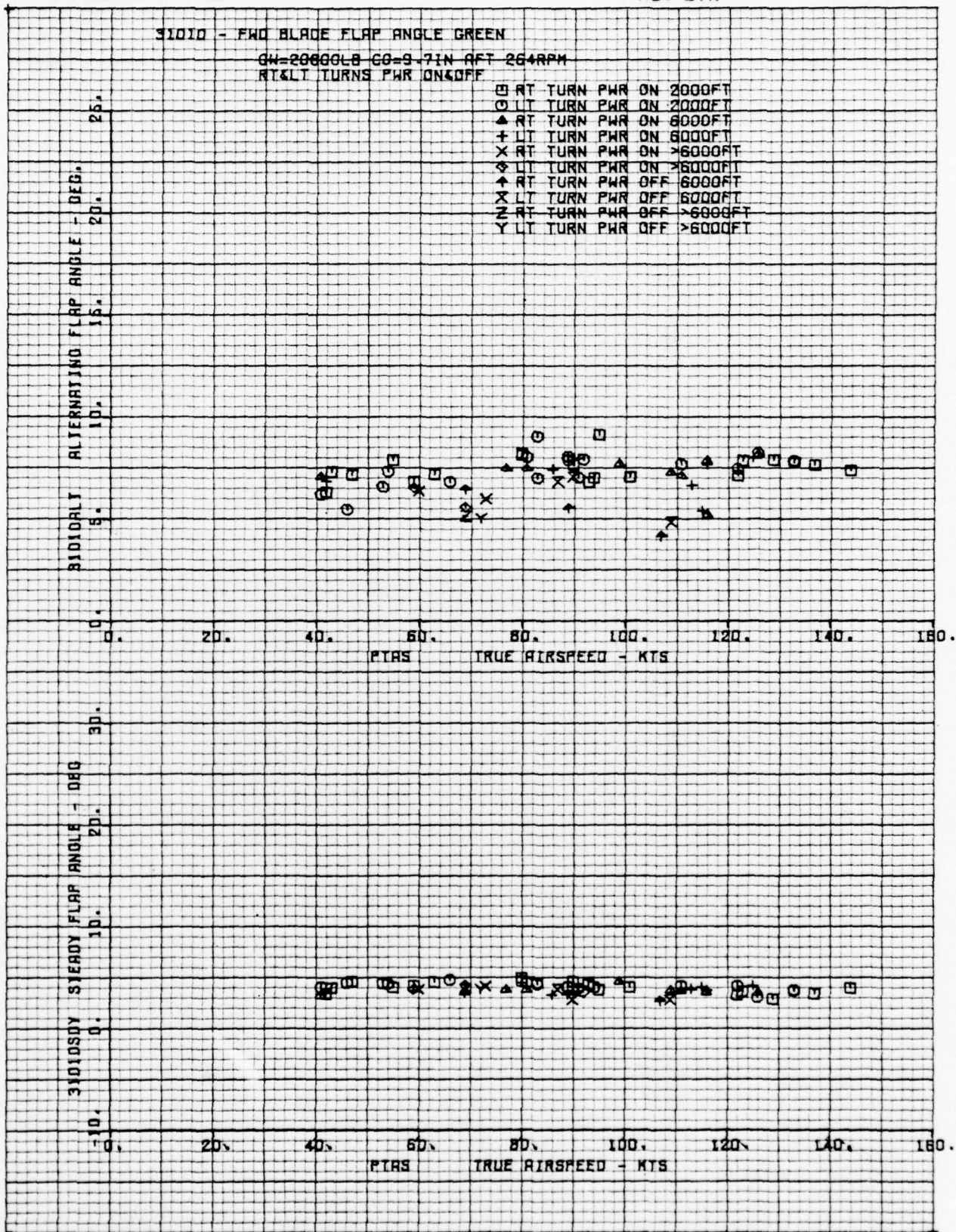


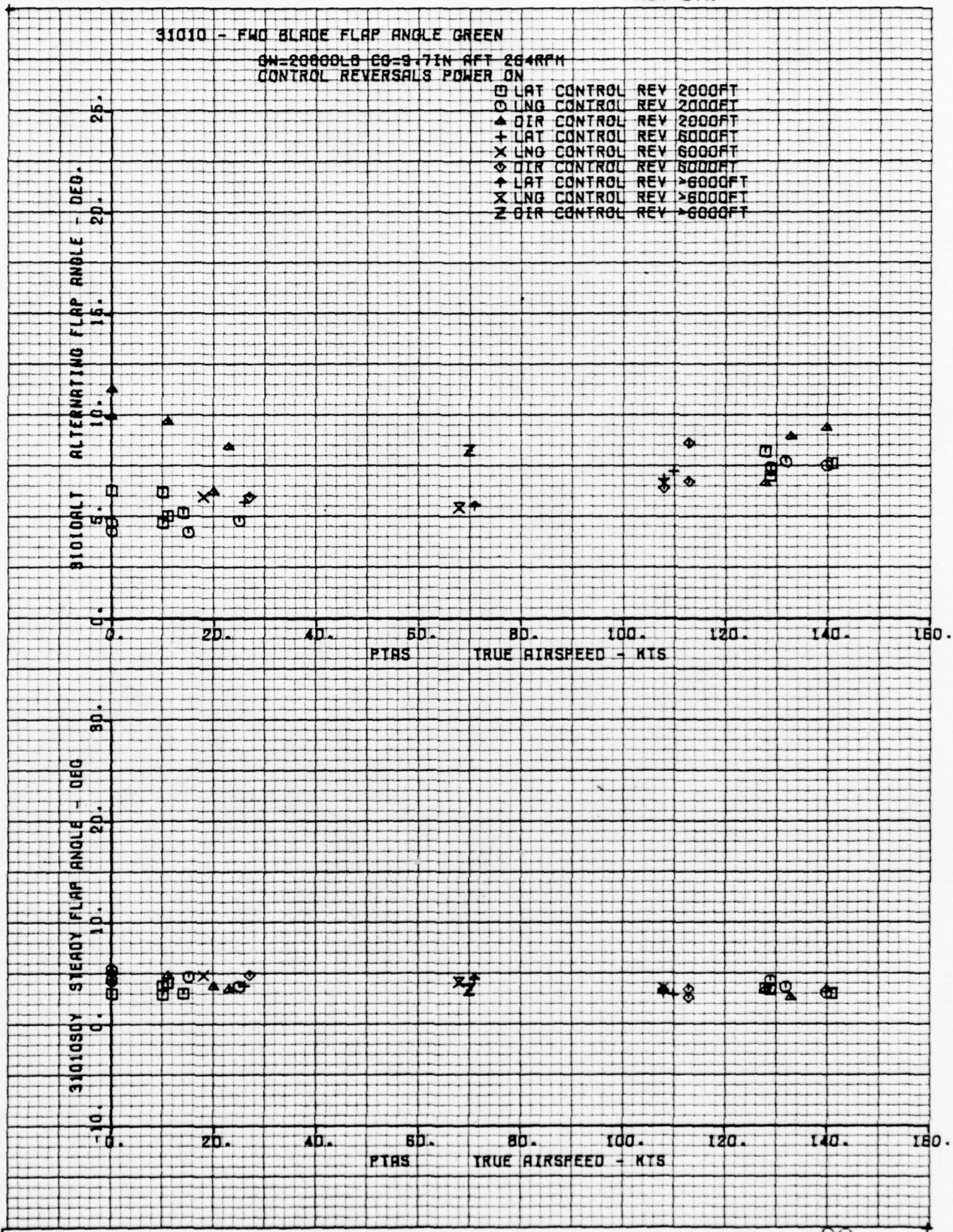


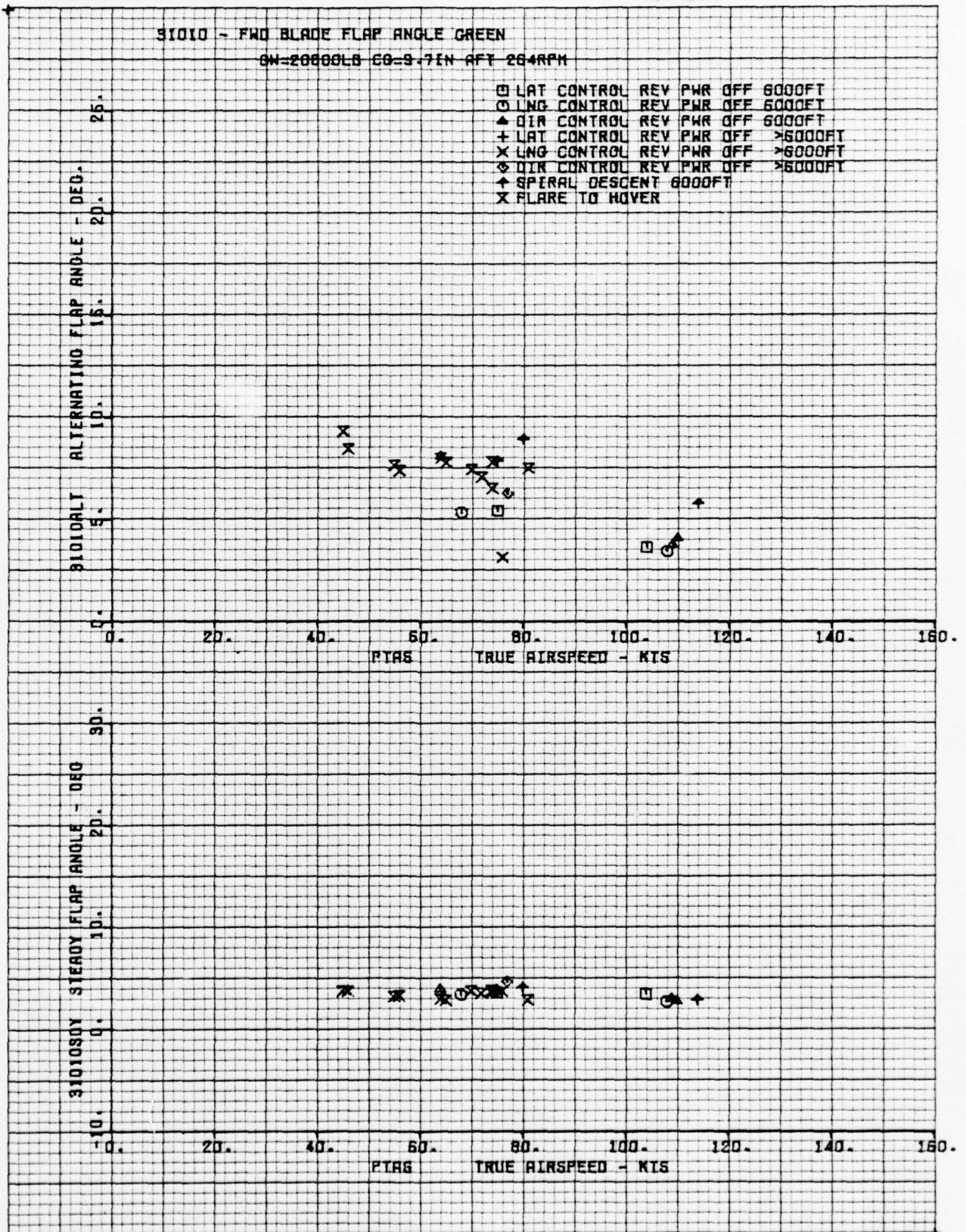


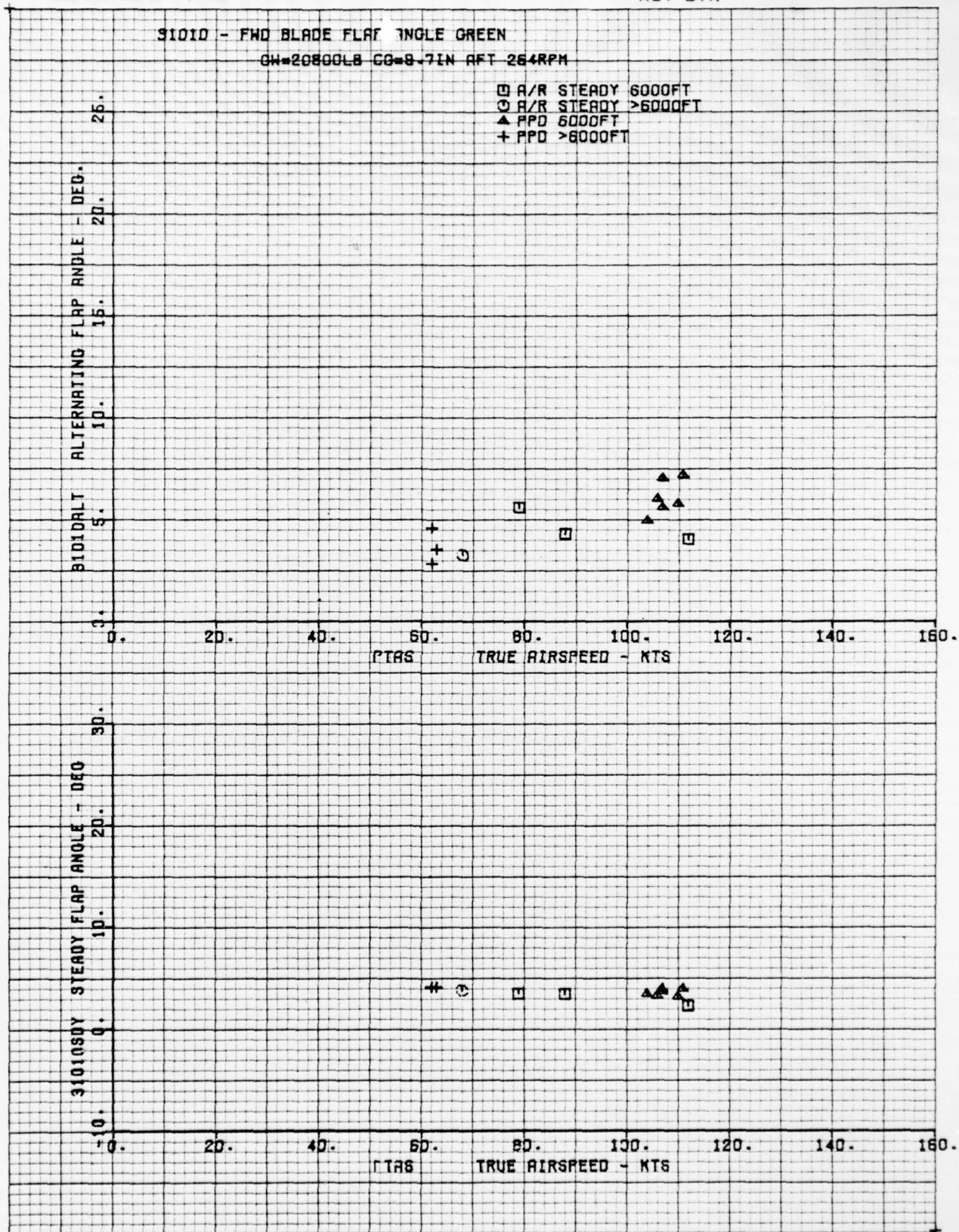


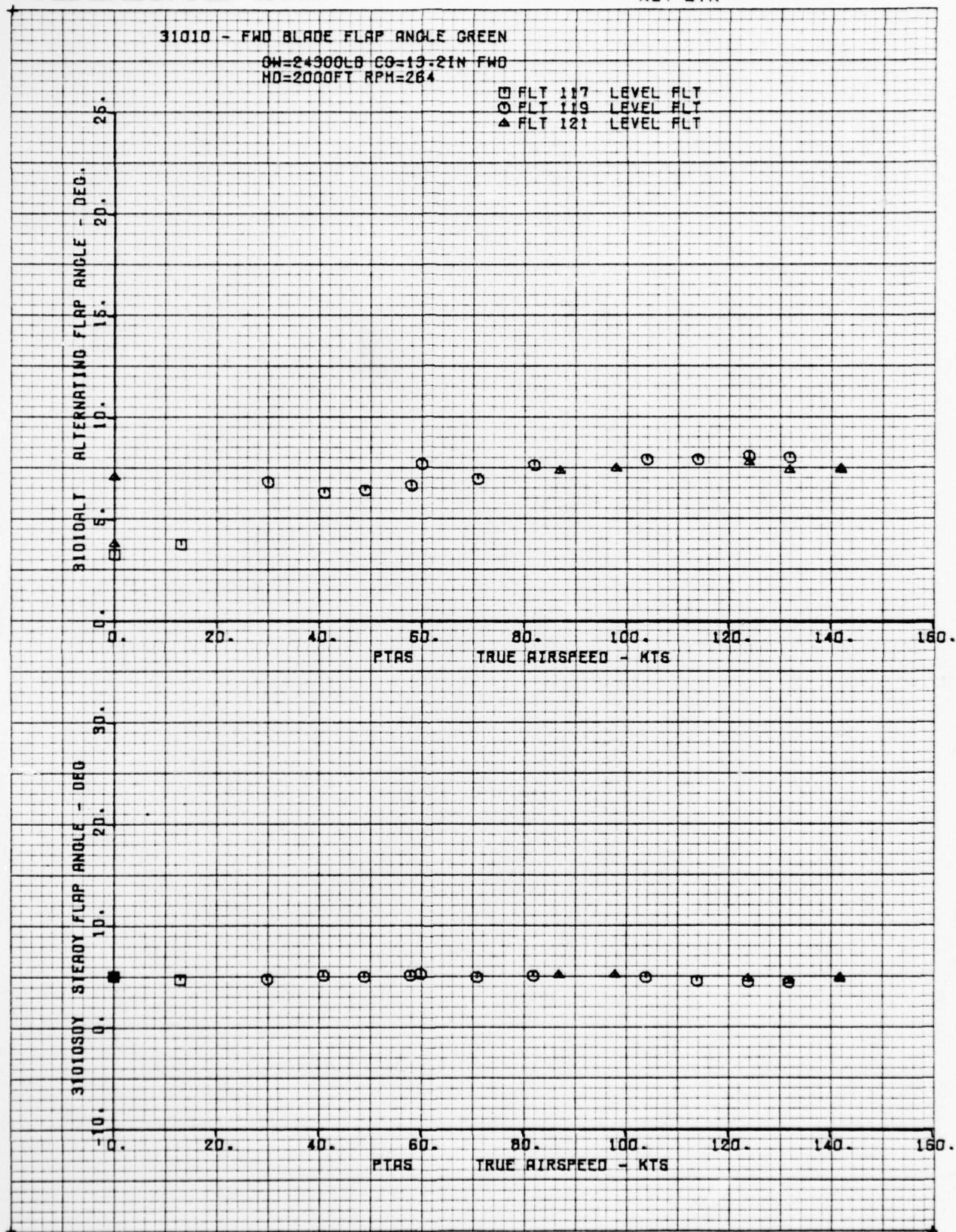


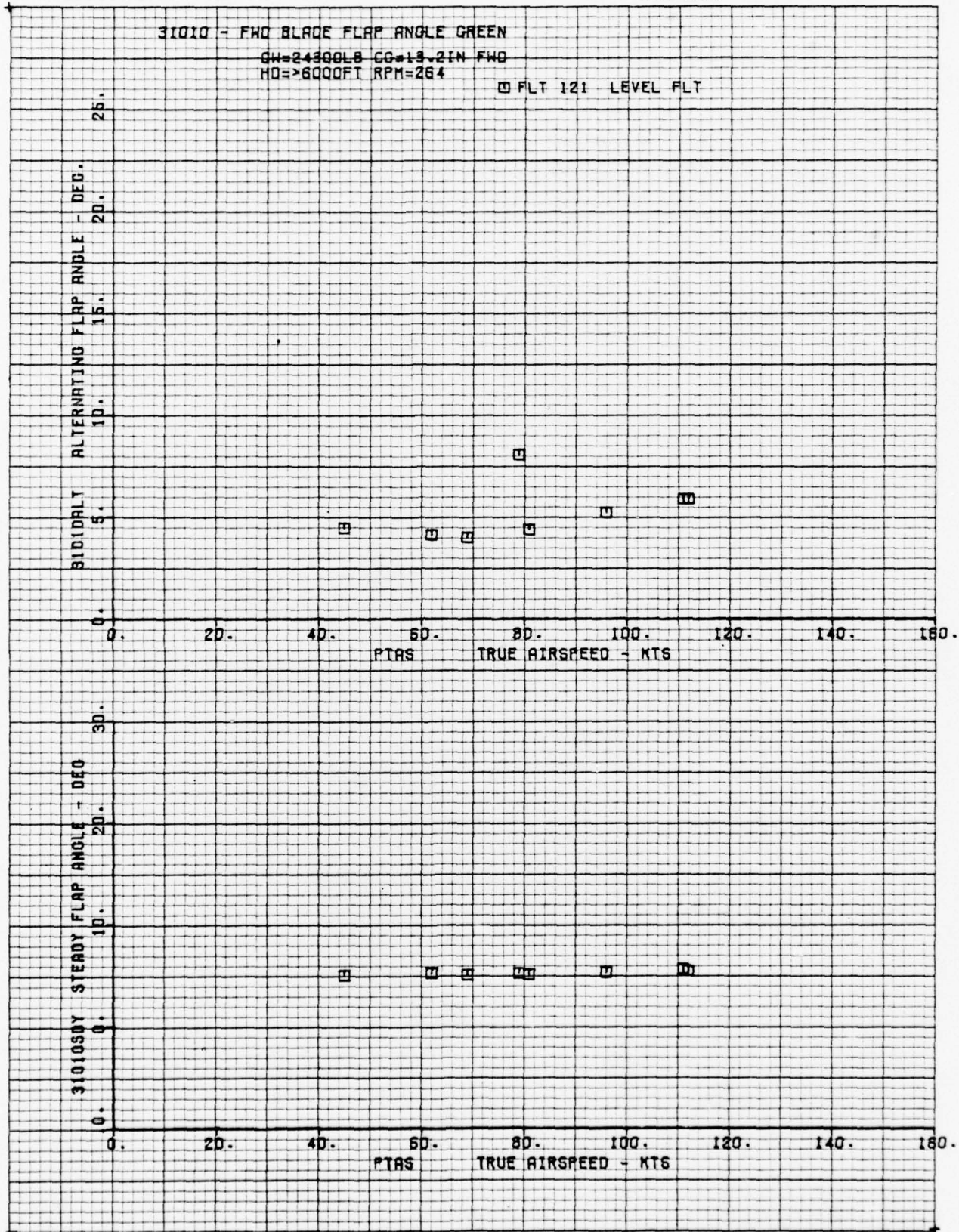


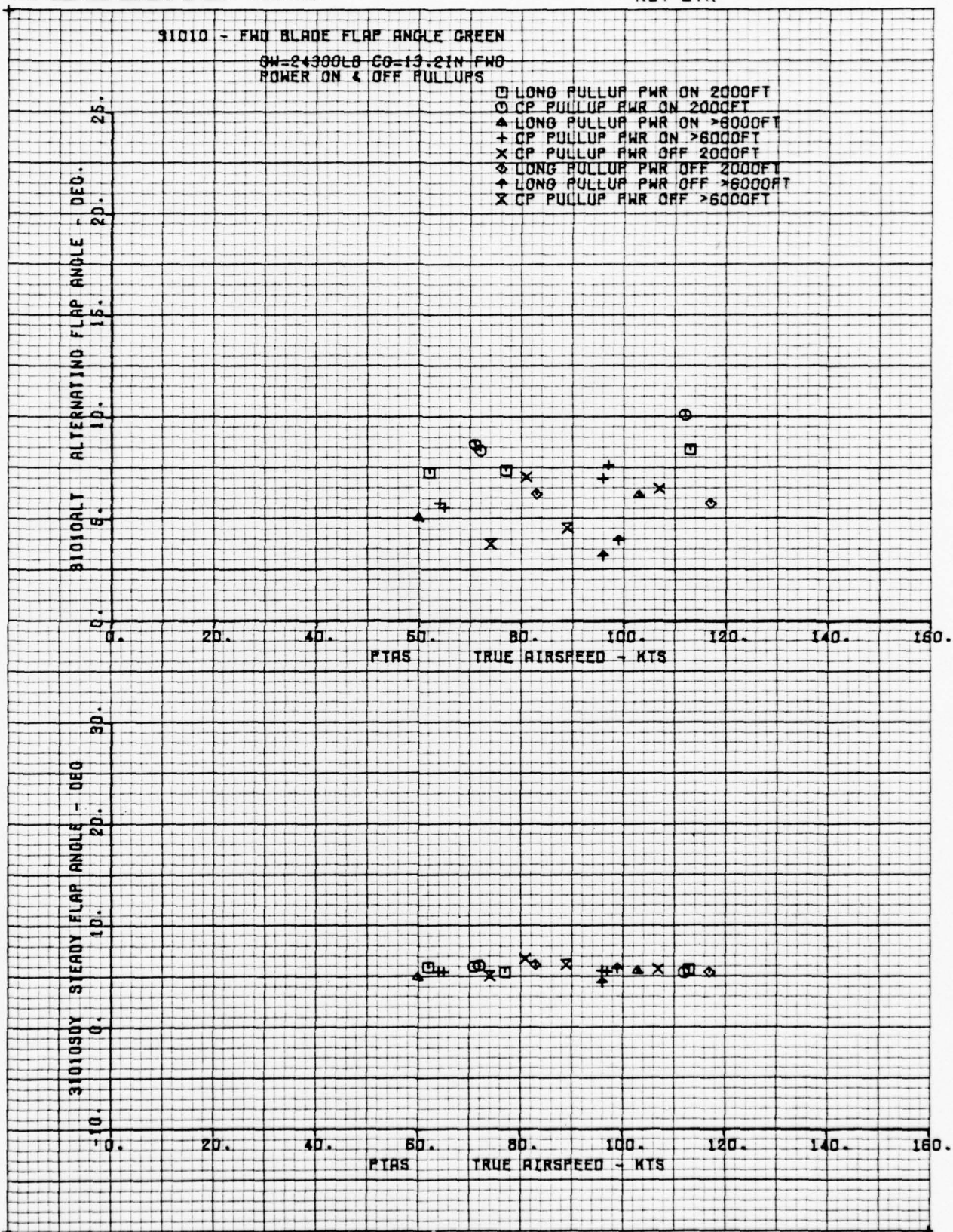


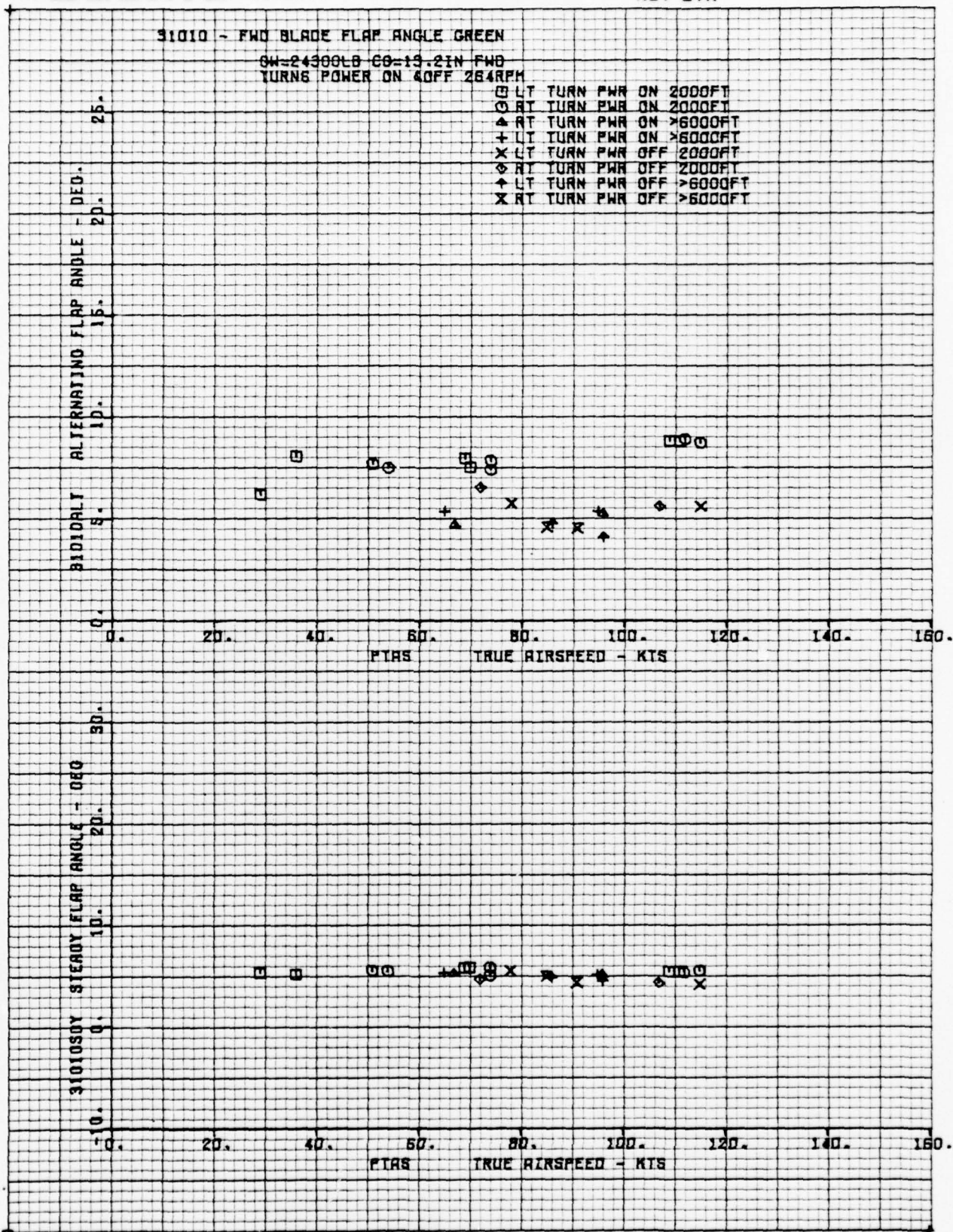


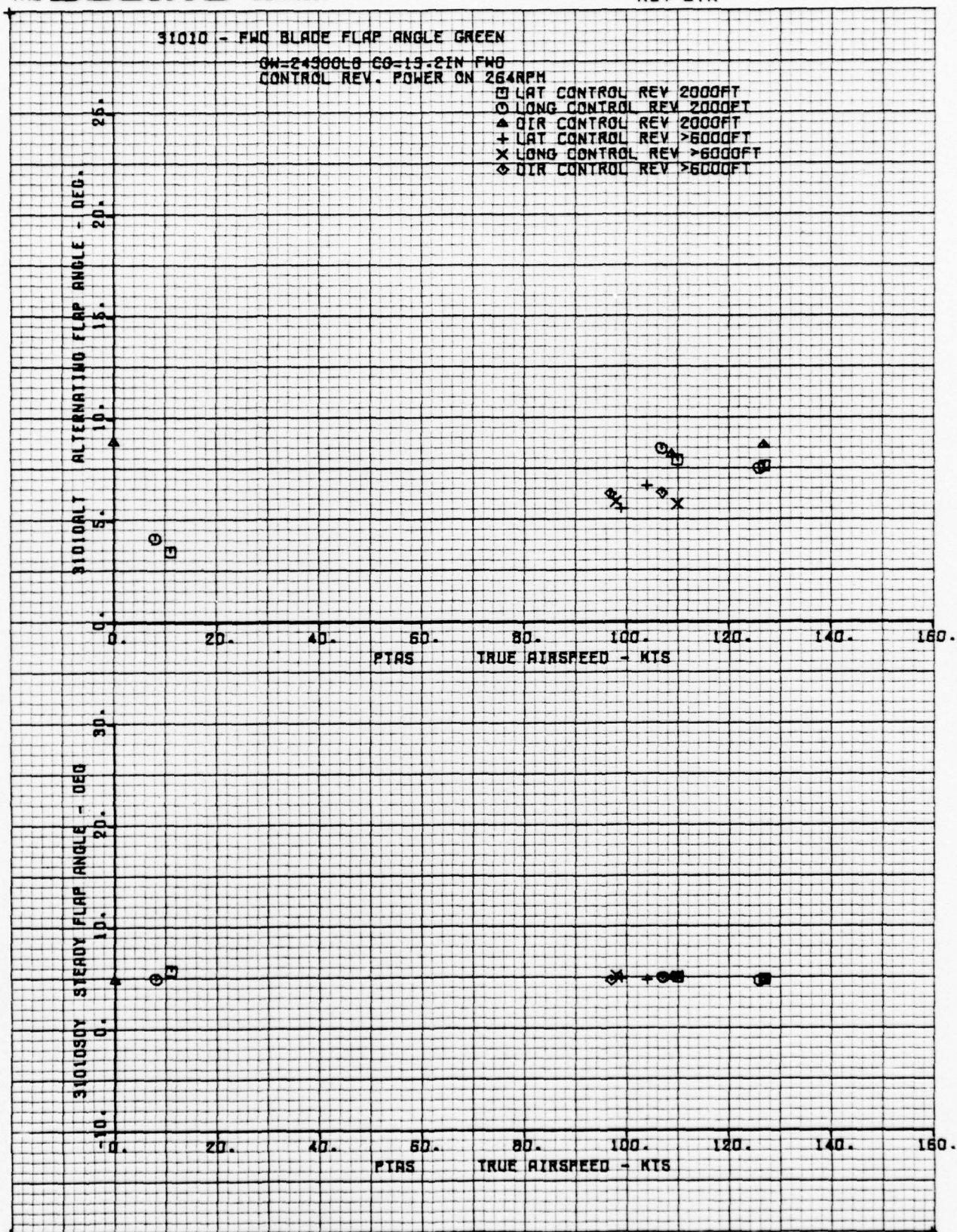


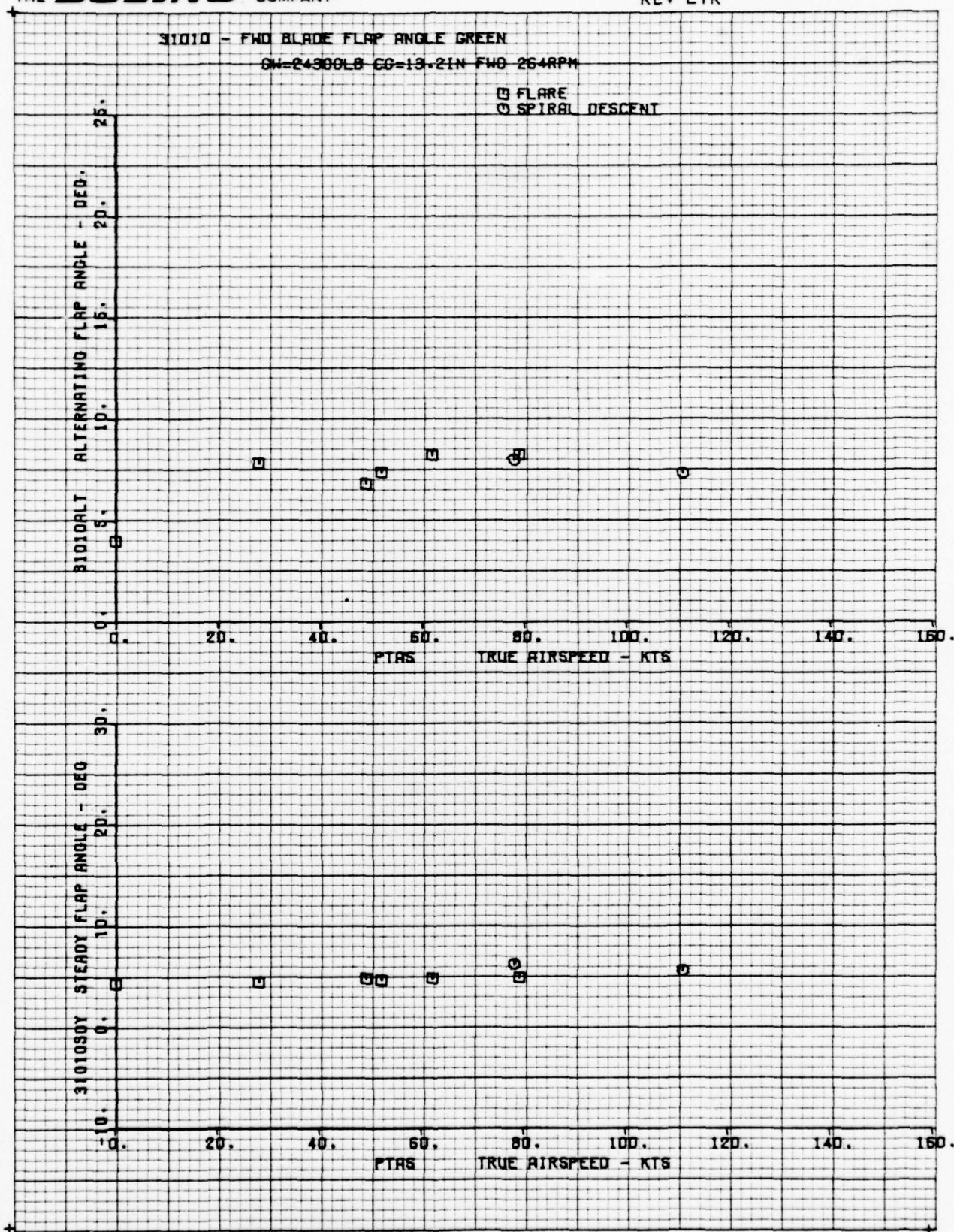


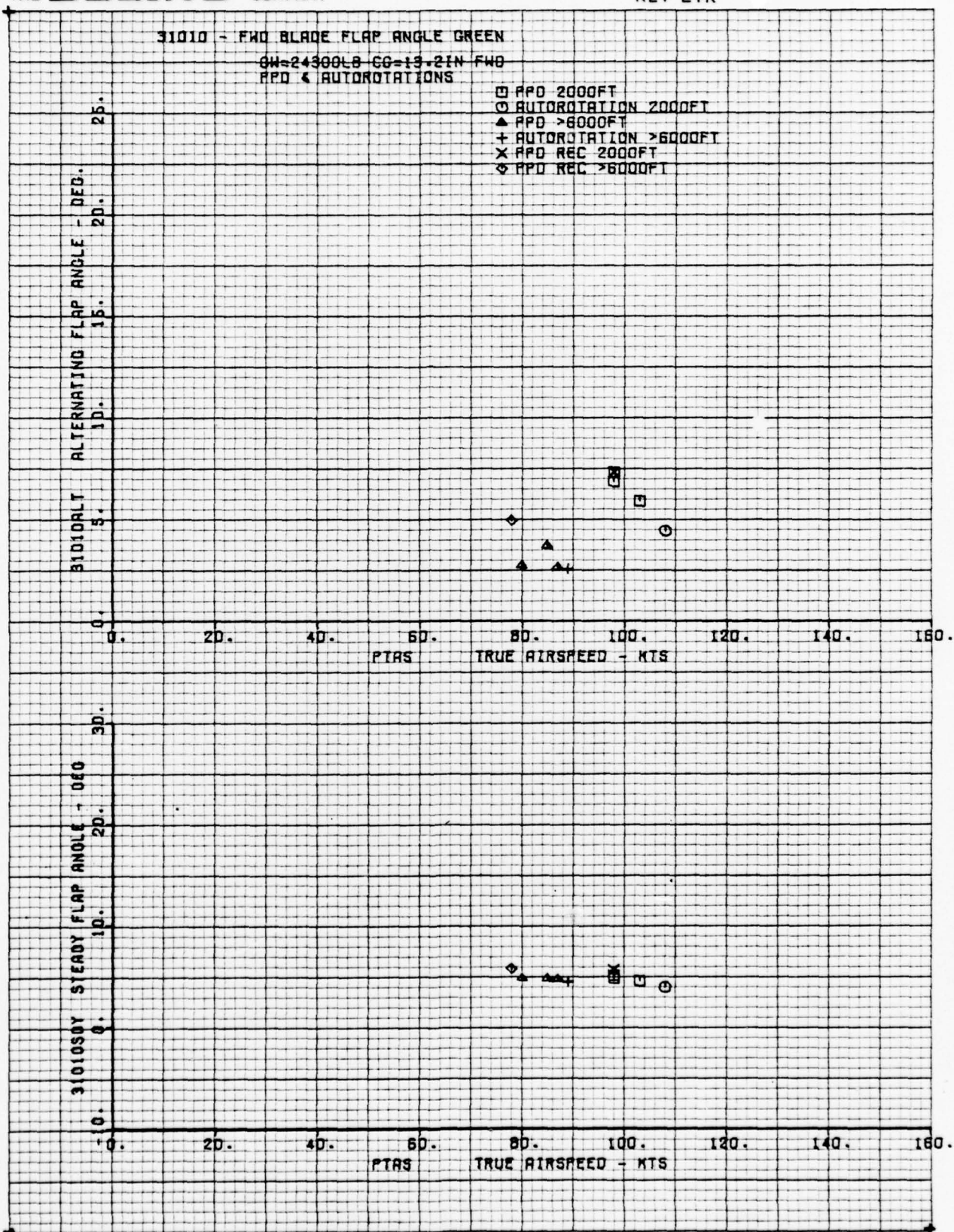


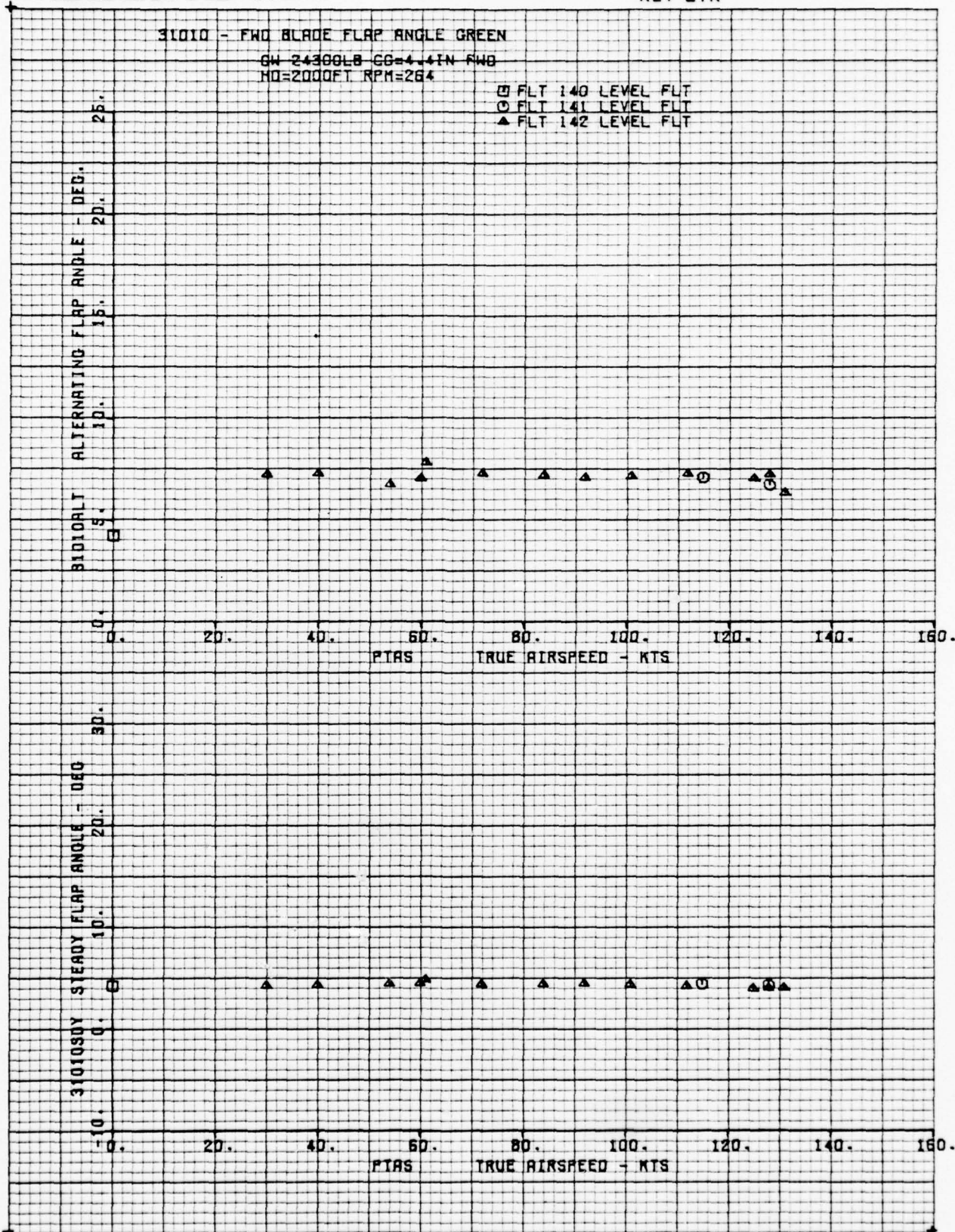


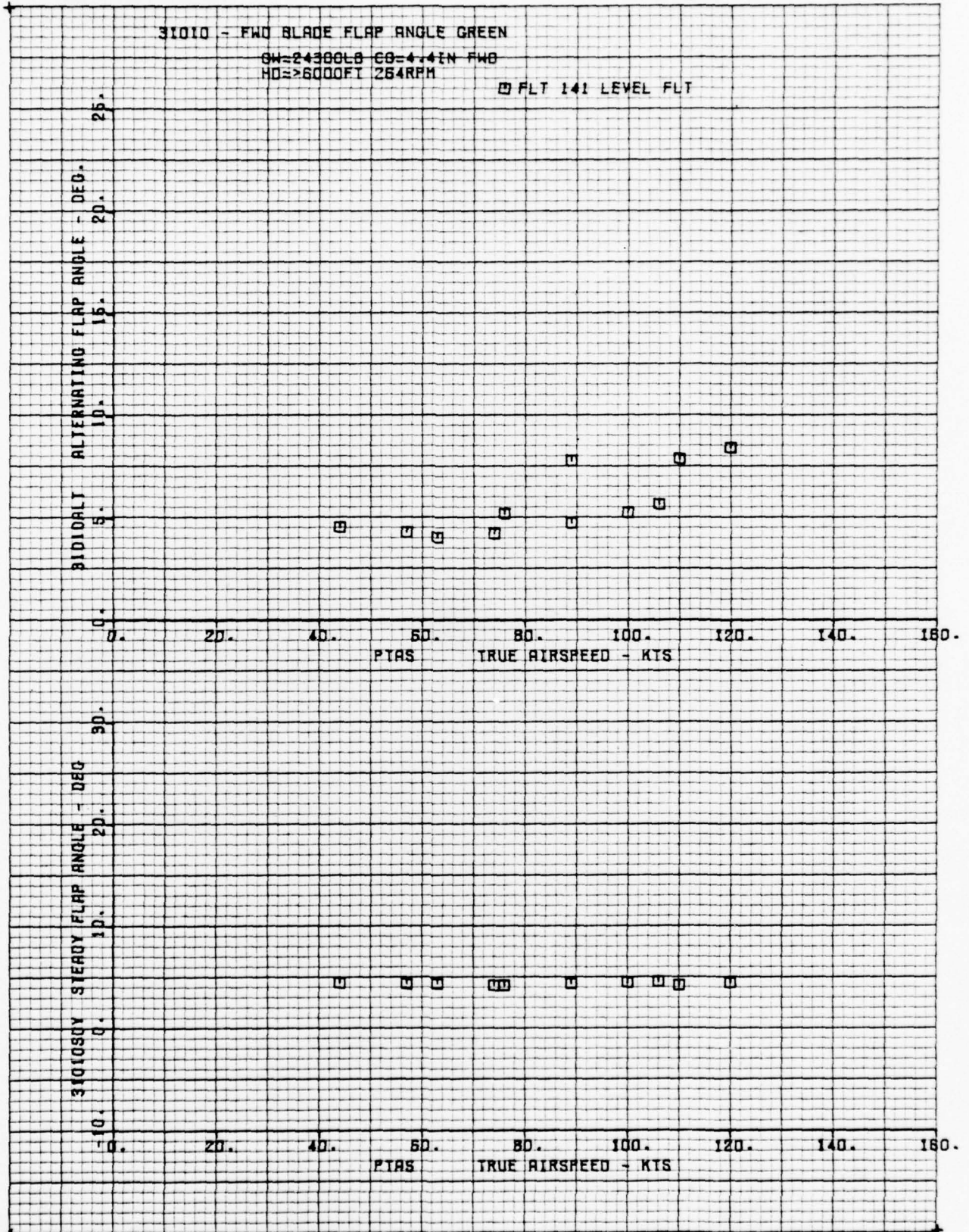


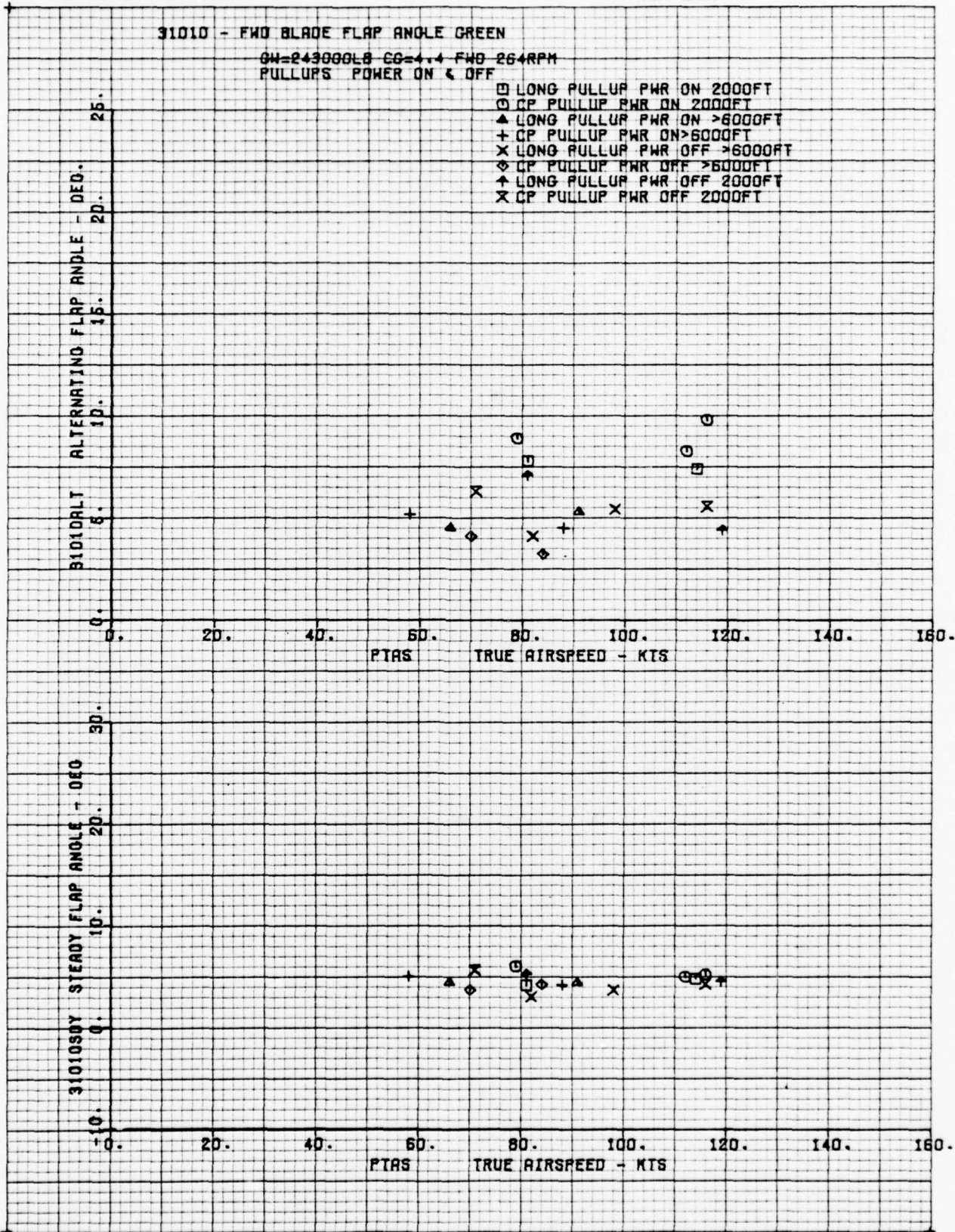


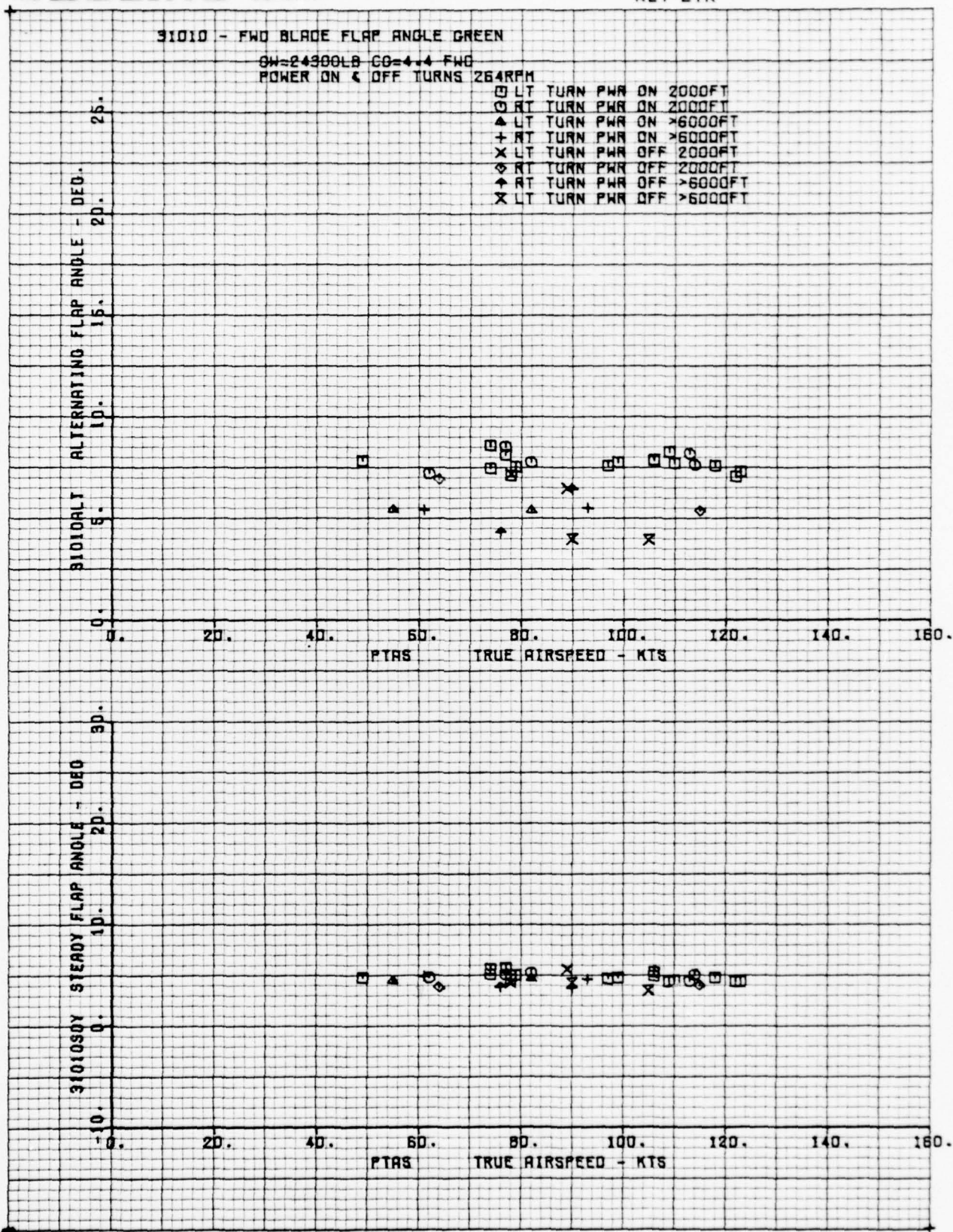


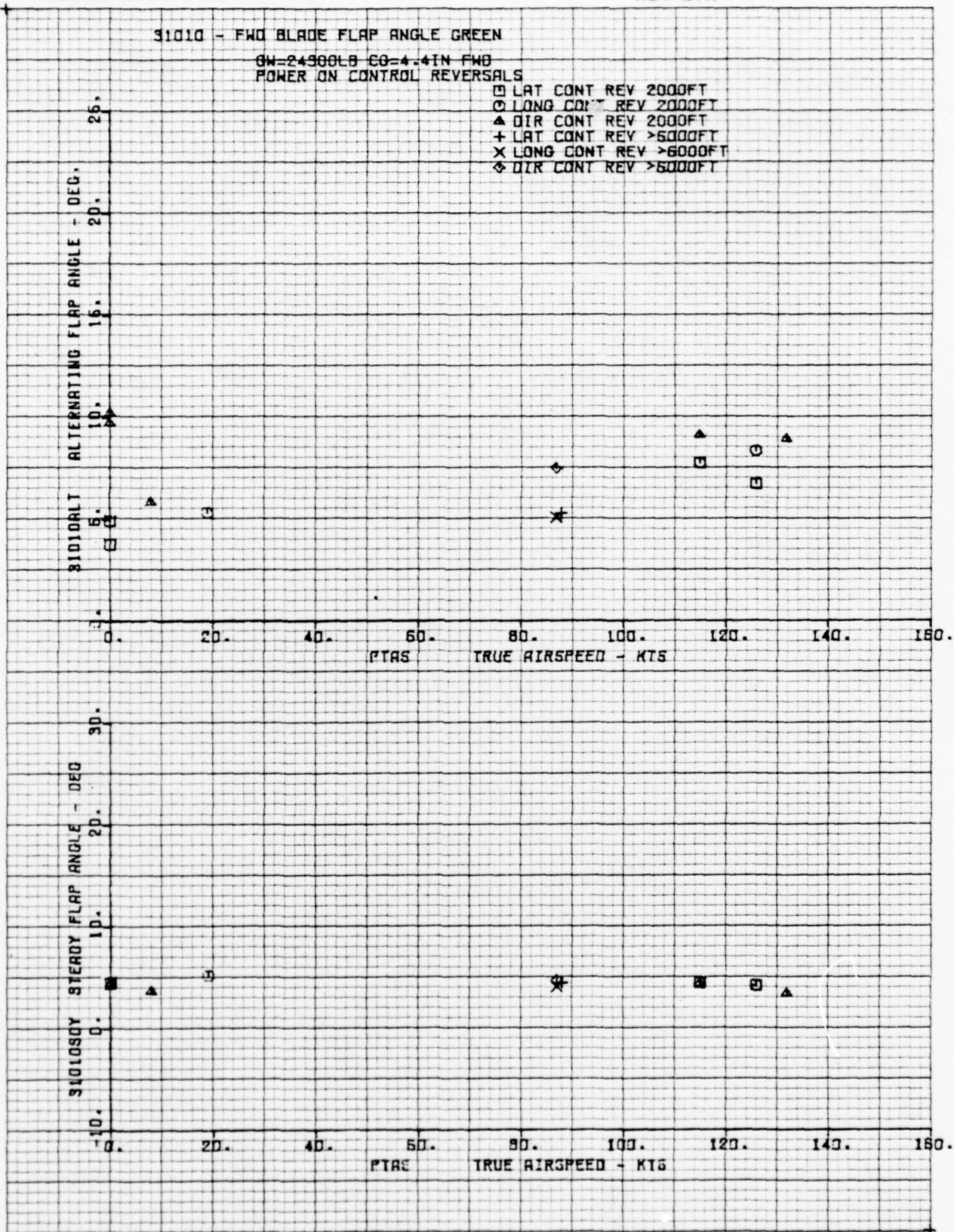


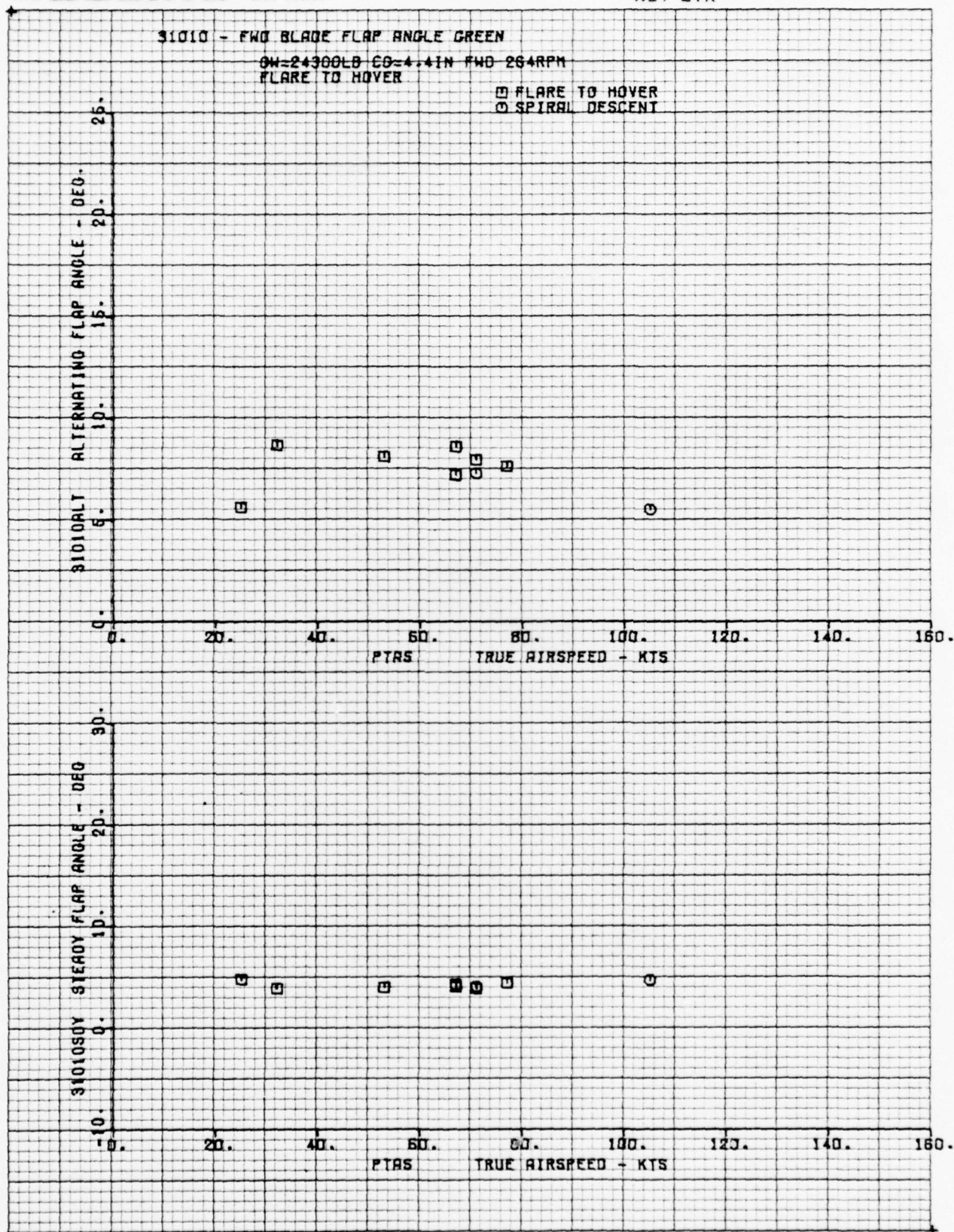


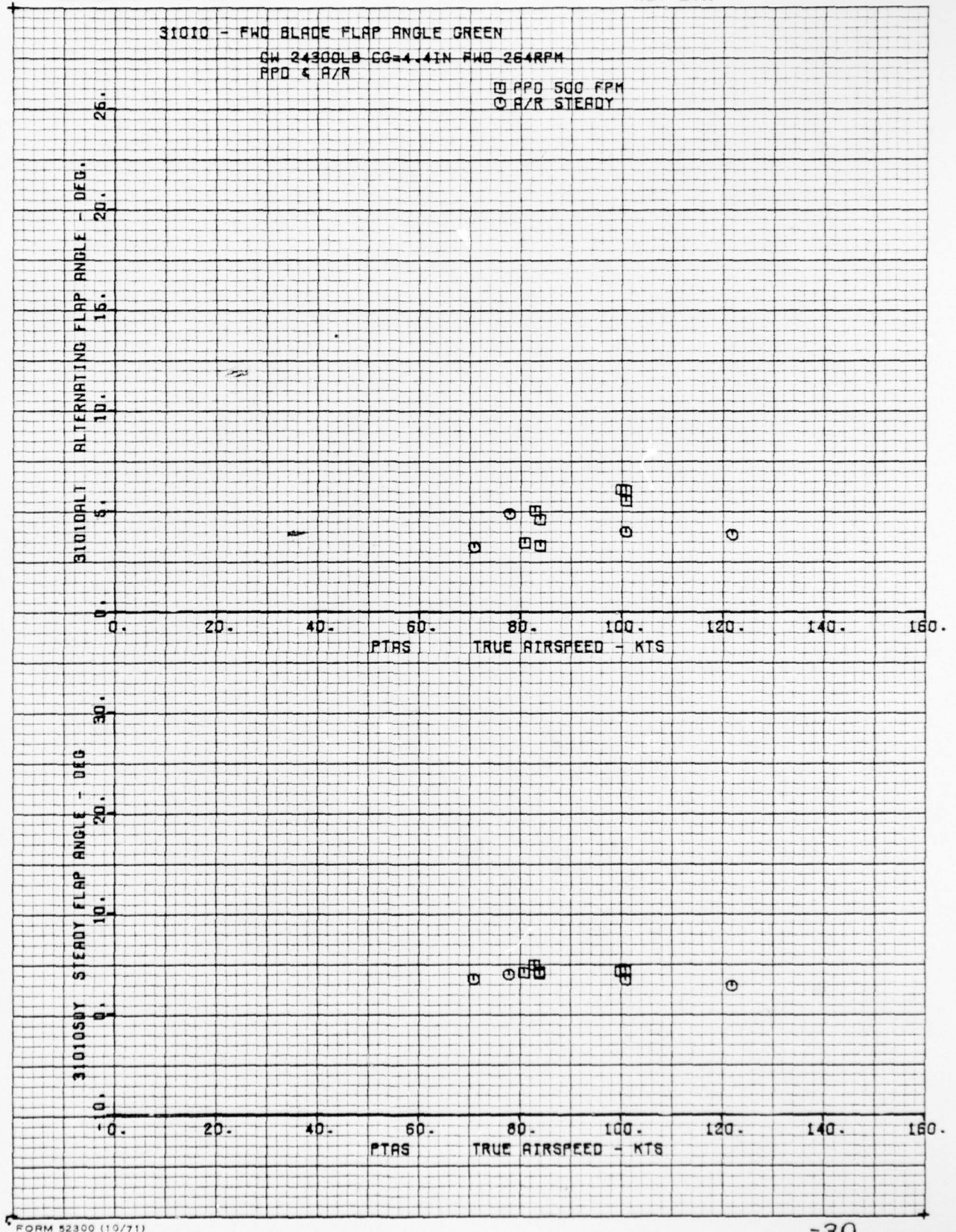




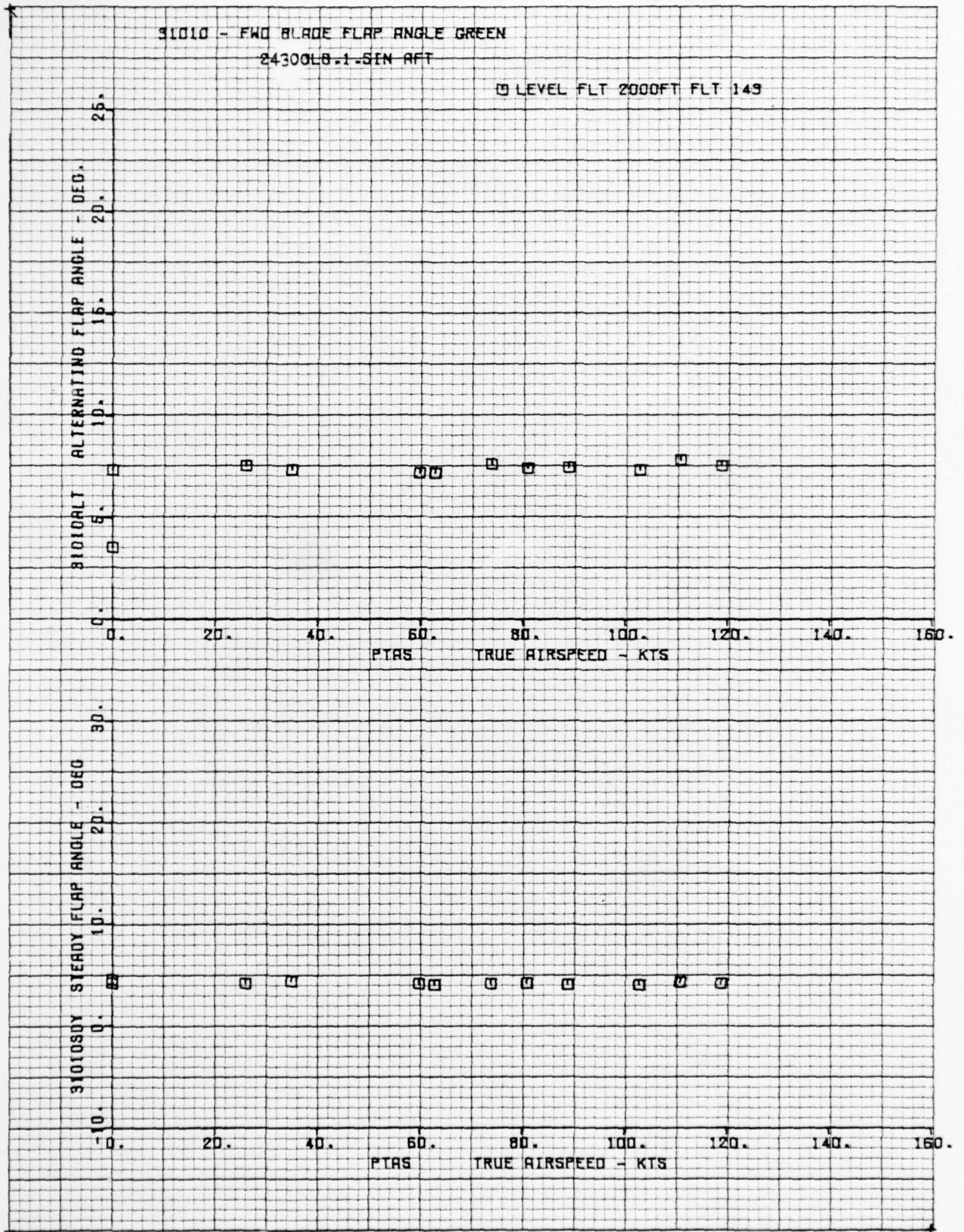






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FORM 52300 (10/71)



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PREPARED BY: J. Bendo

CHECKED BY:

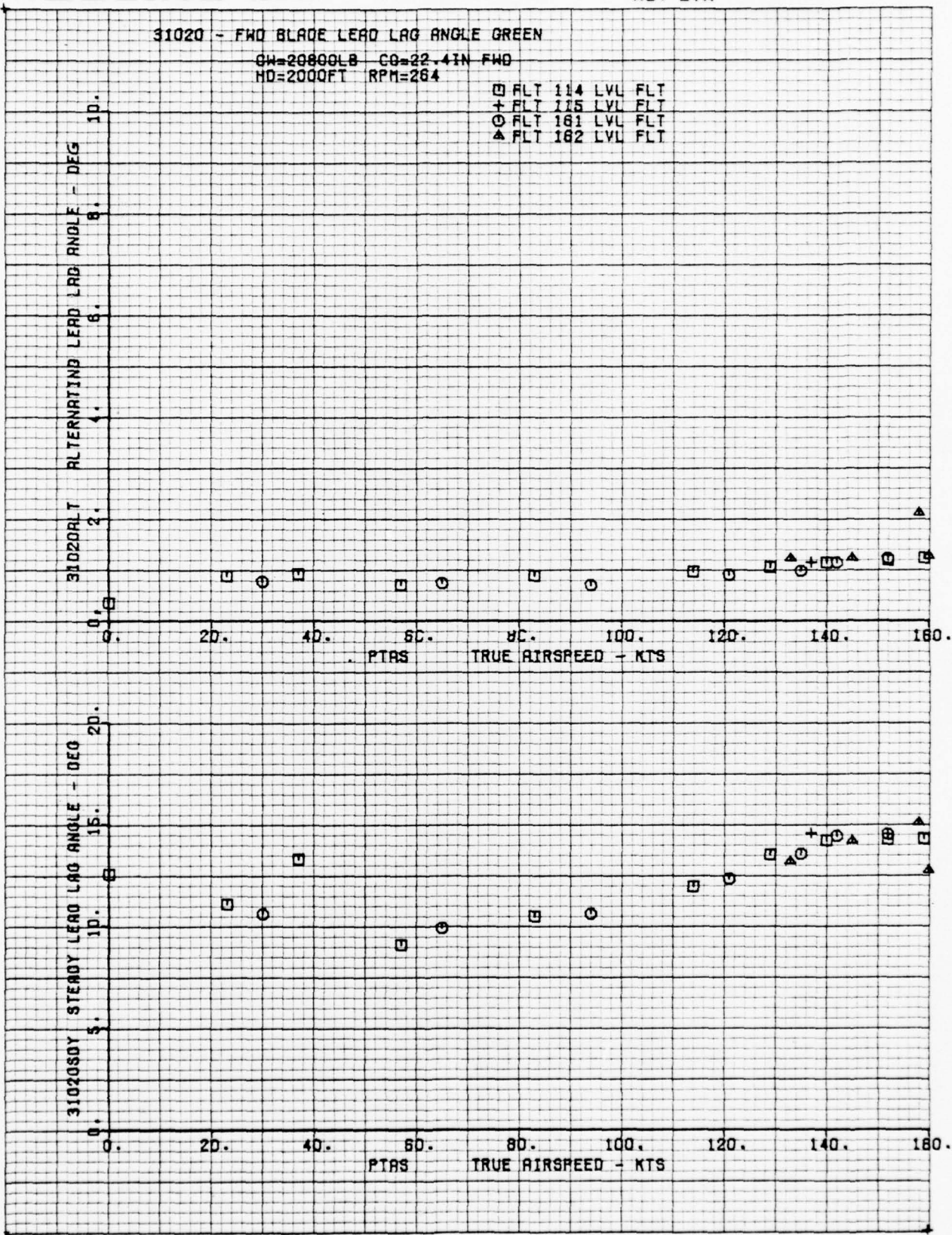
DATE: 8/28/78

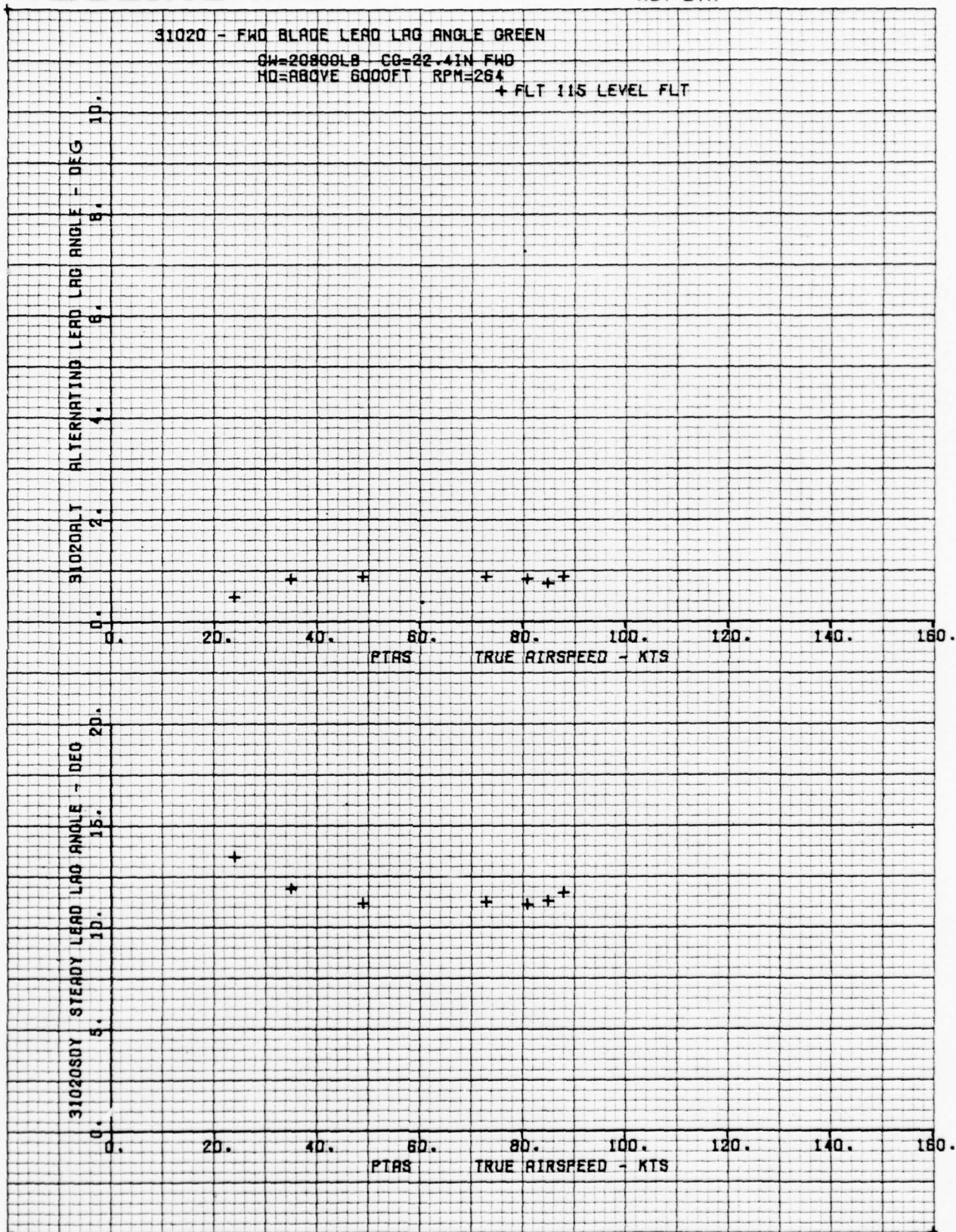
NUMBER D210-11168-3

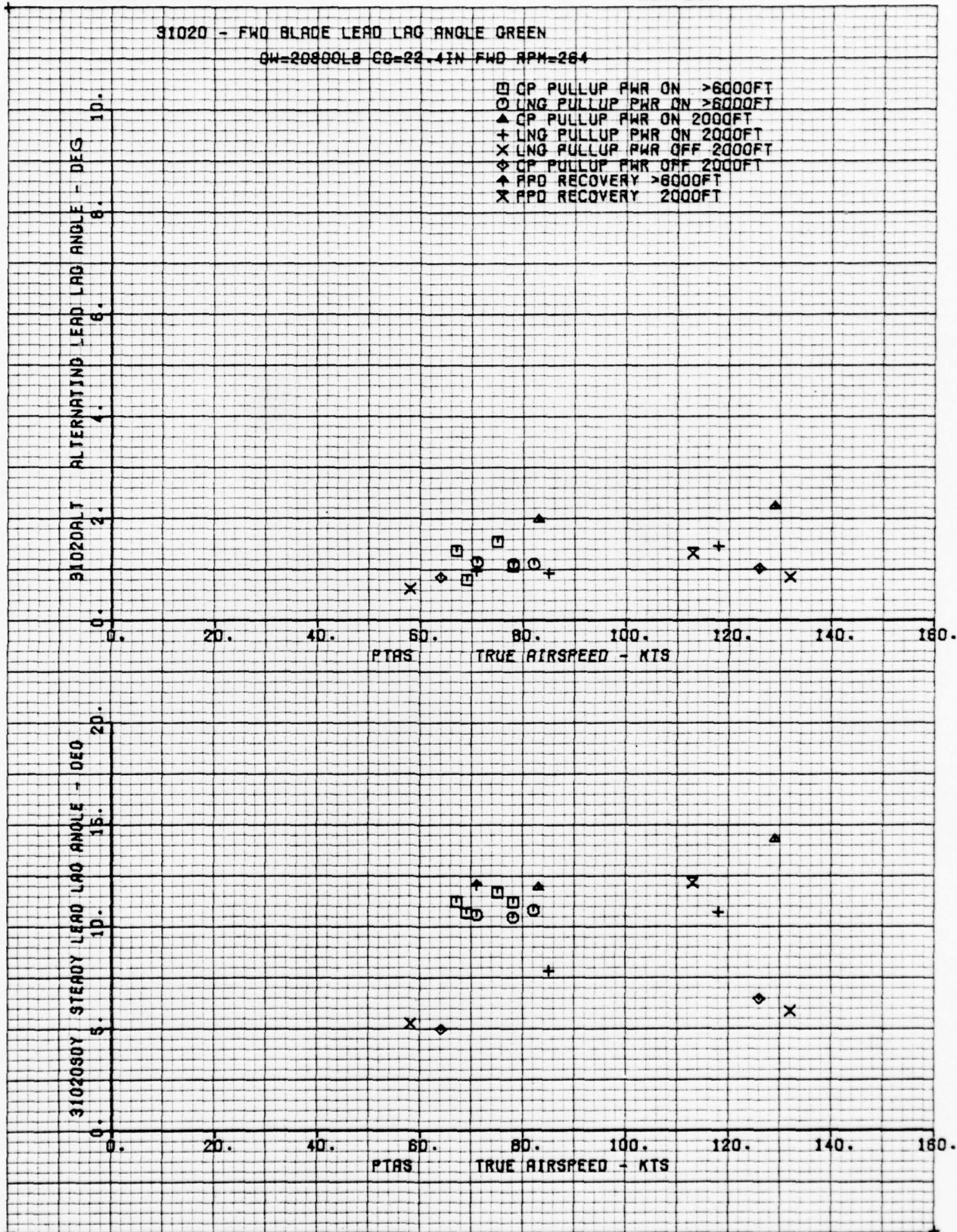
REV LTR Volume 2

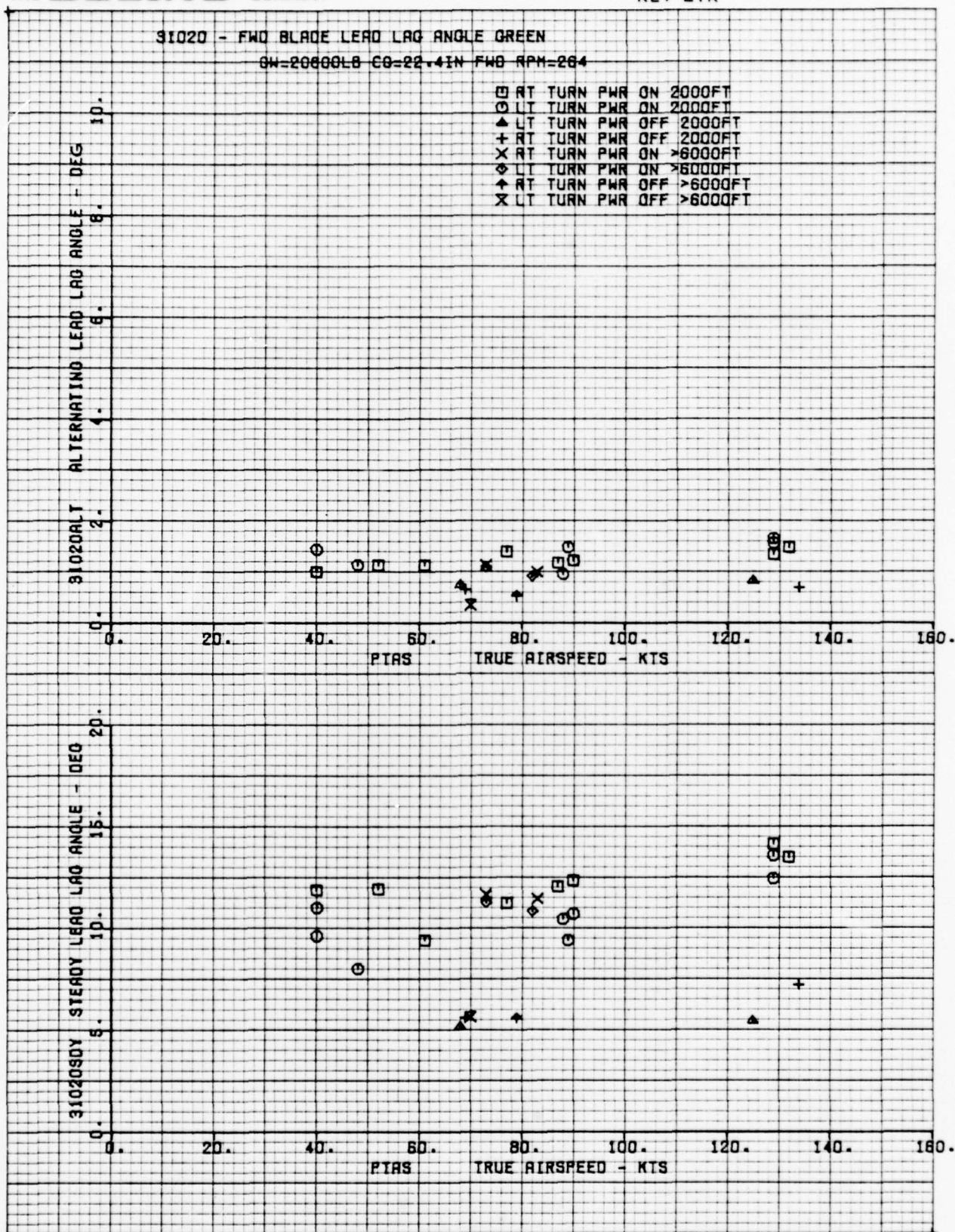
MODEL NO.

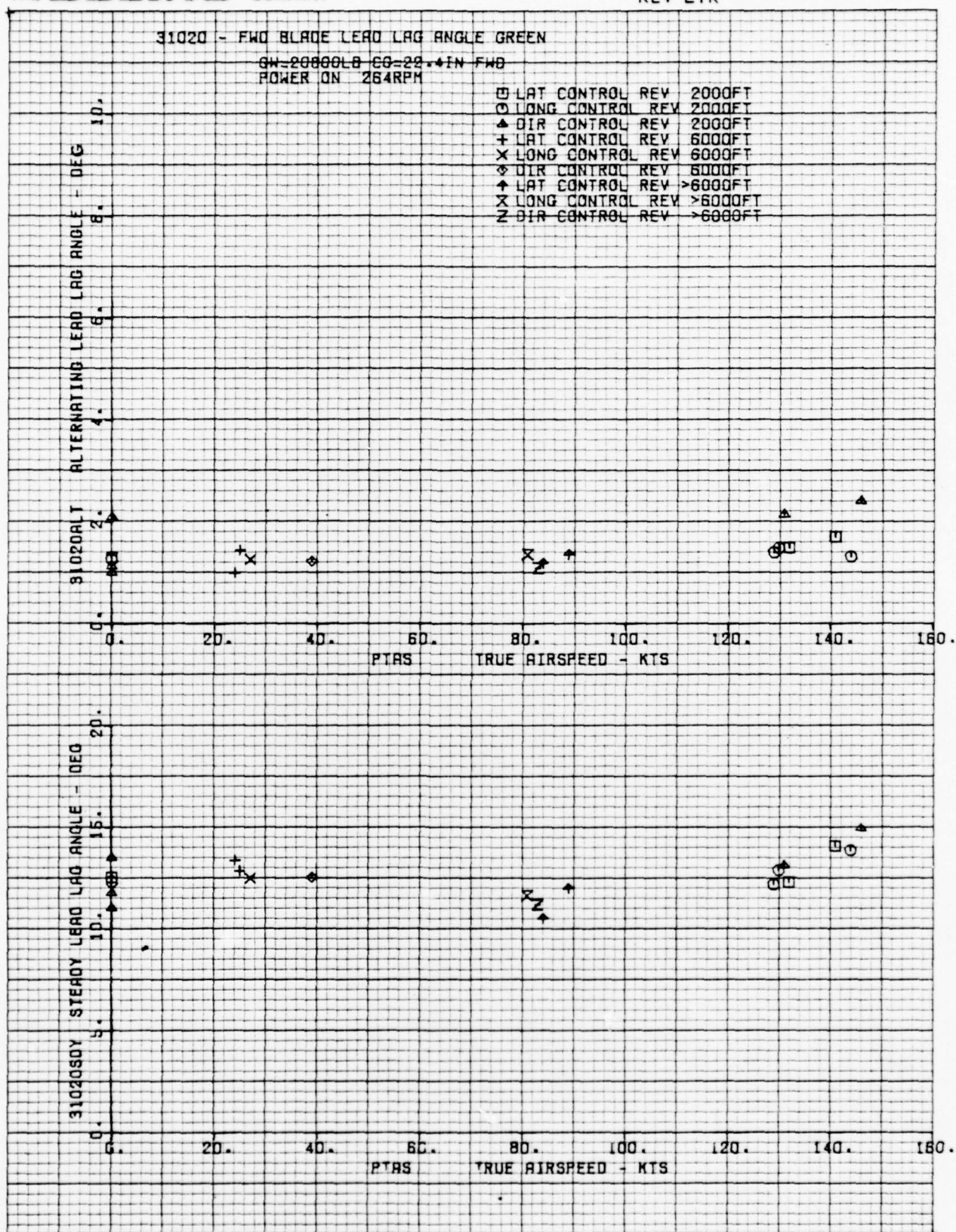
4.2 Forward Blade Lead Lag Angle

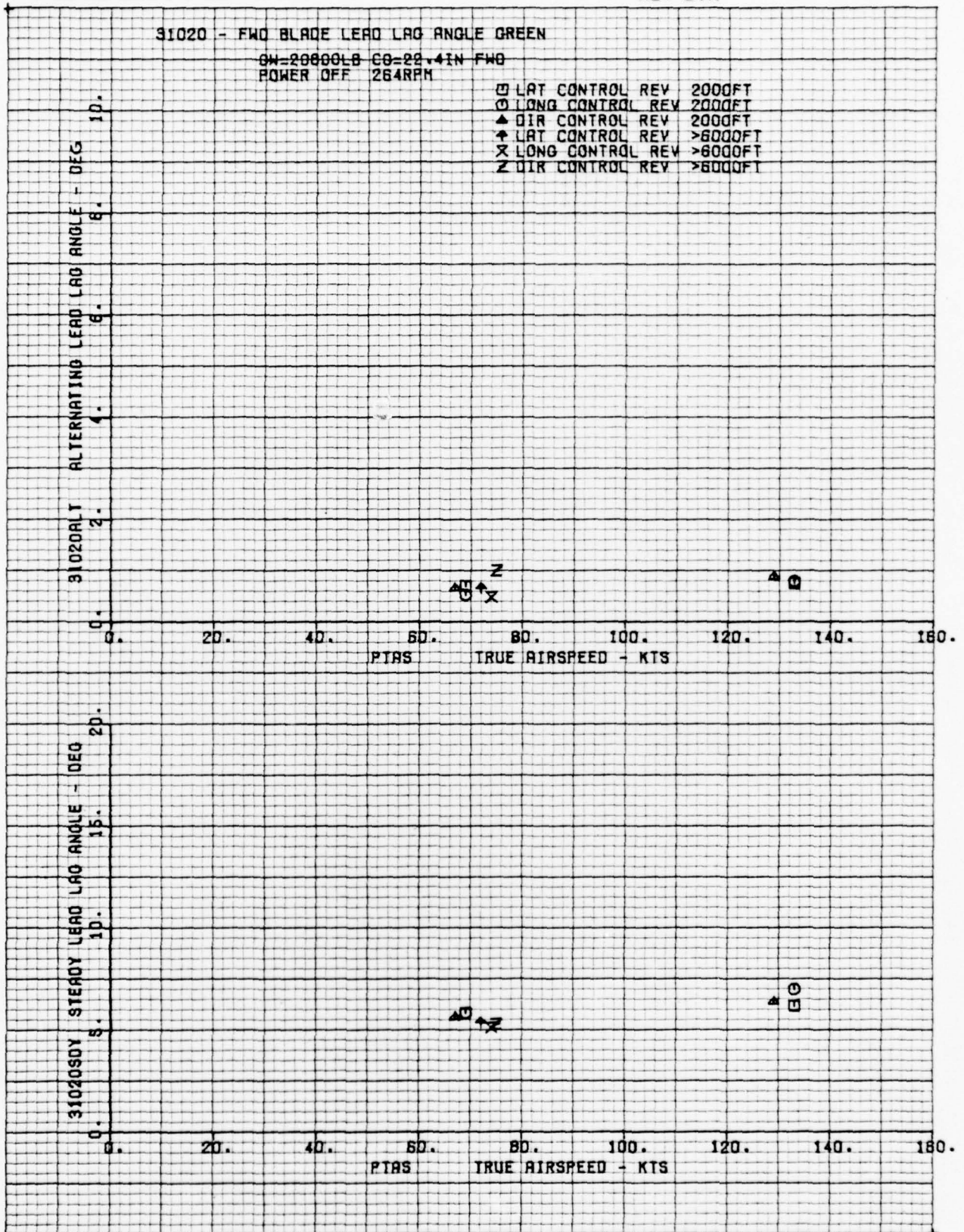


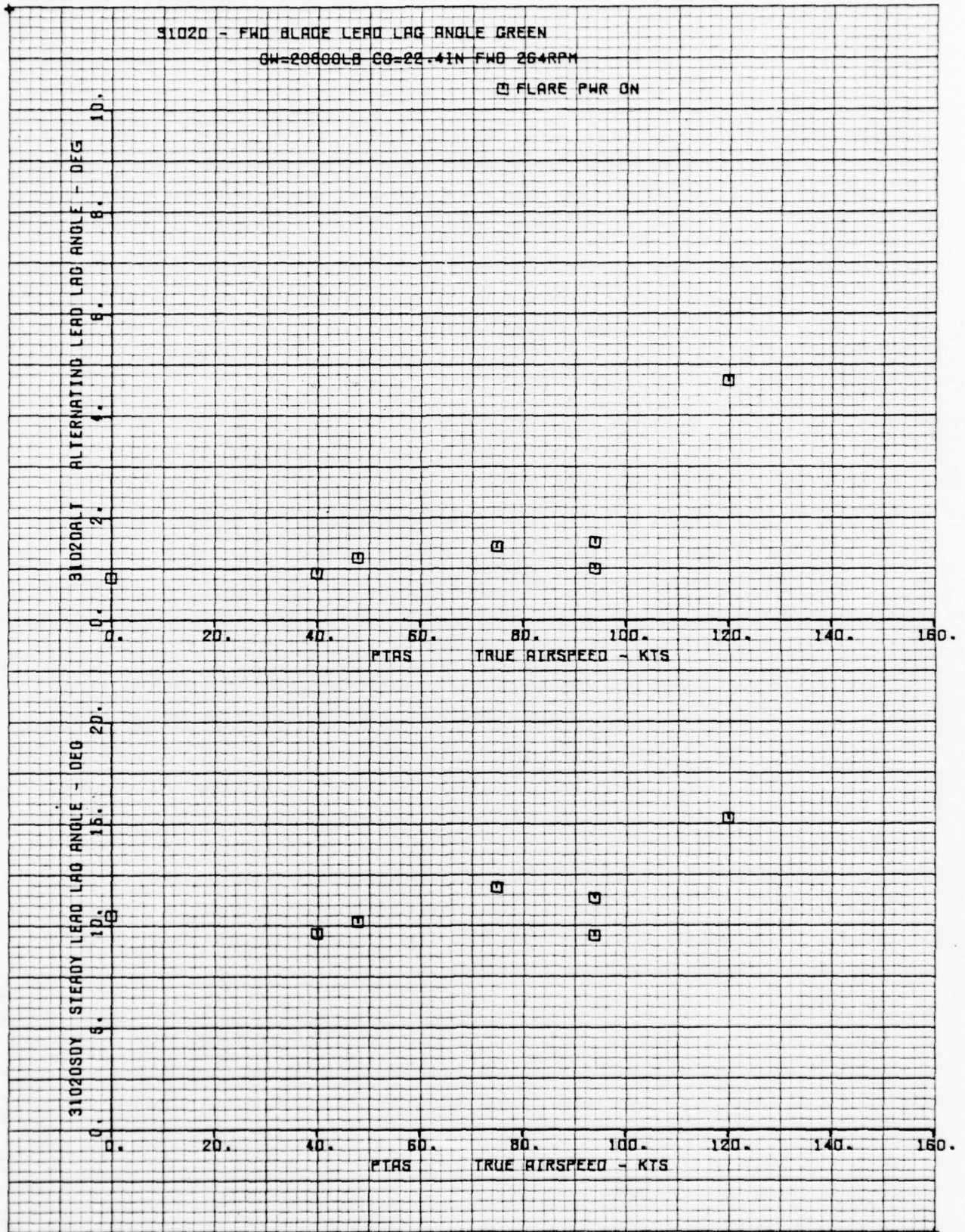


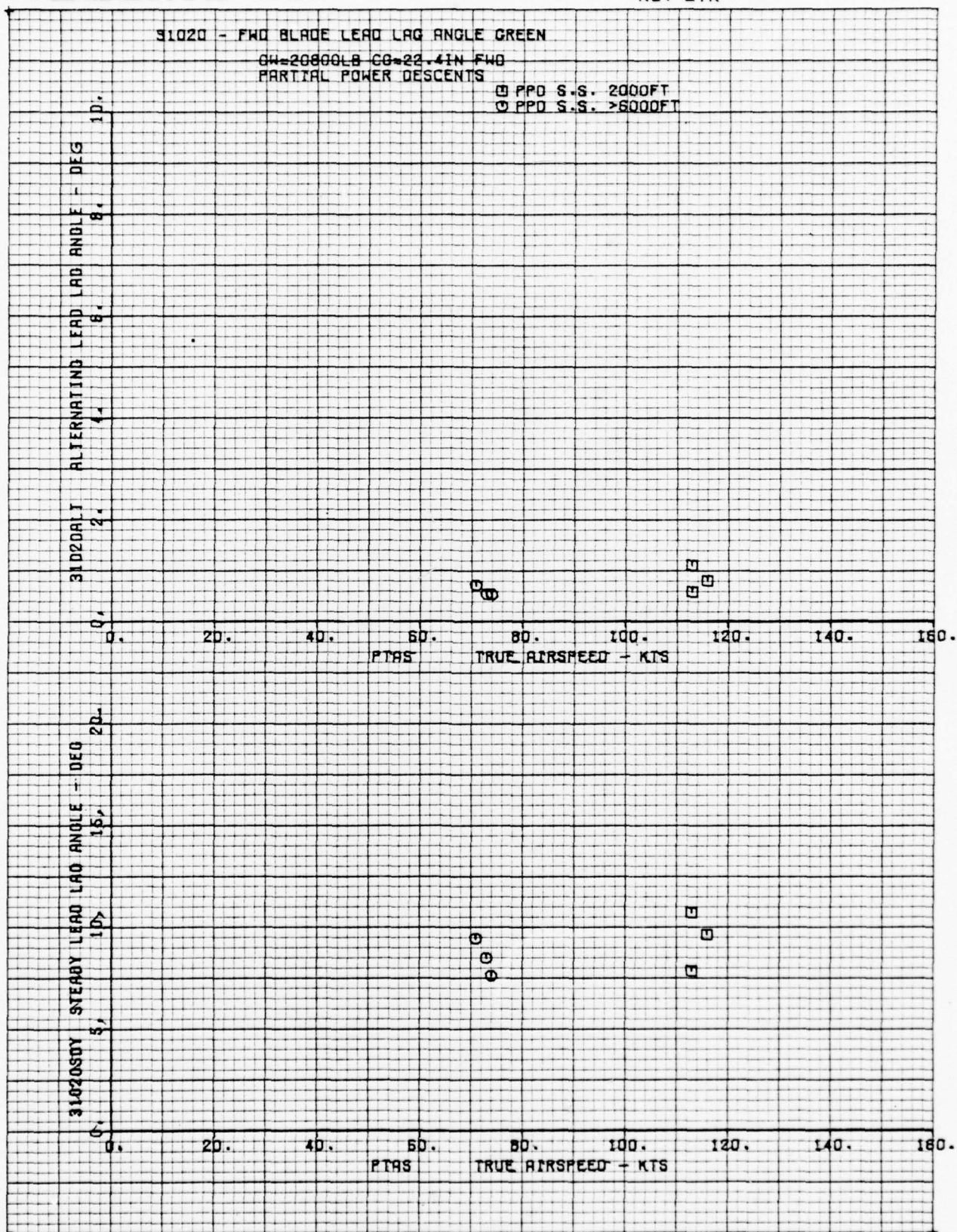


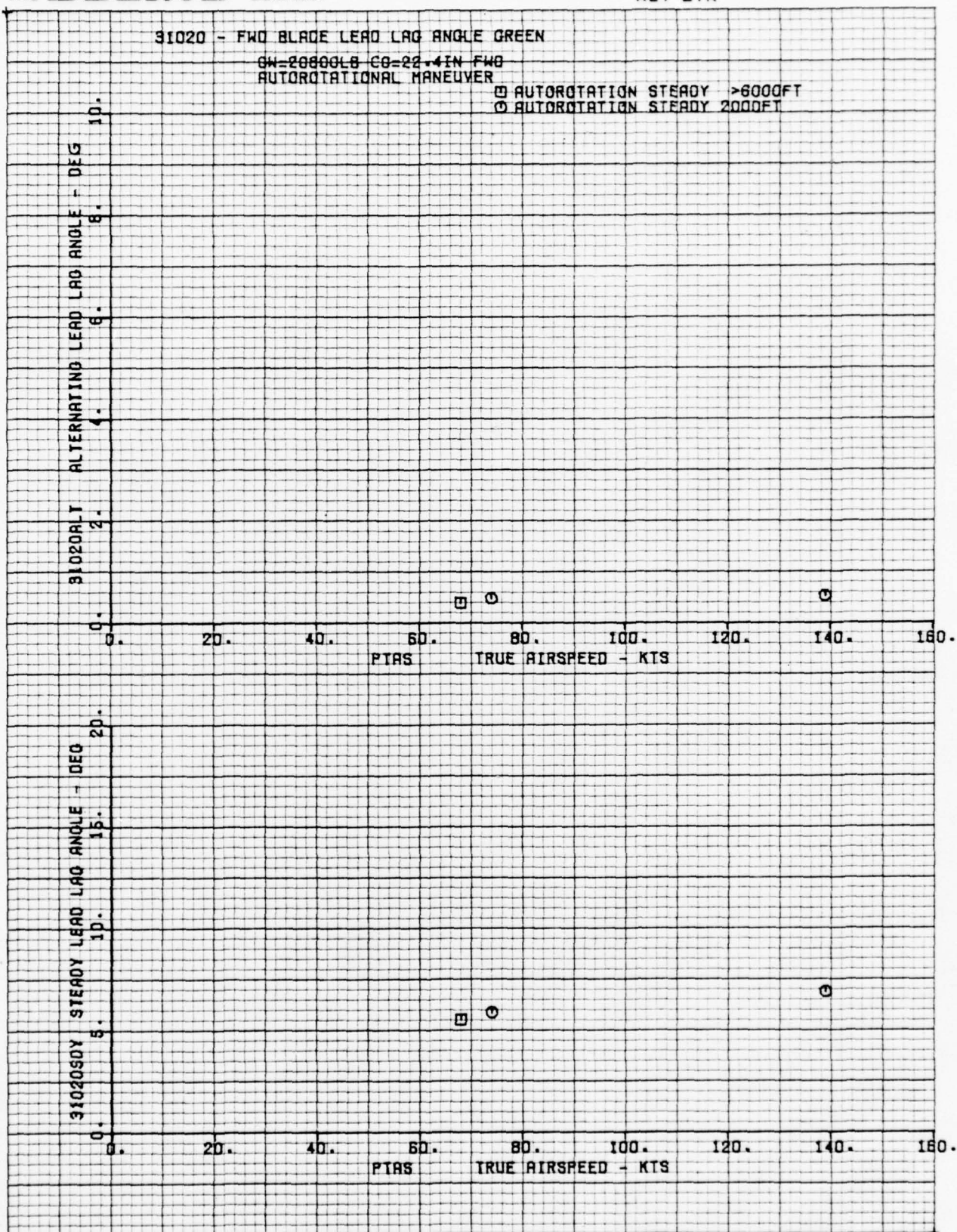


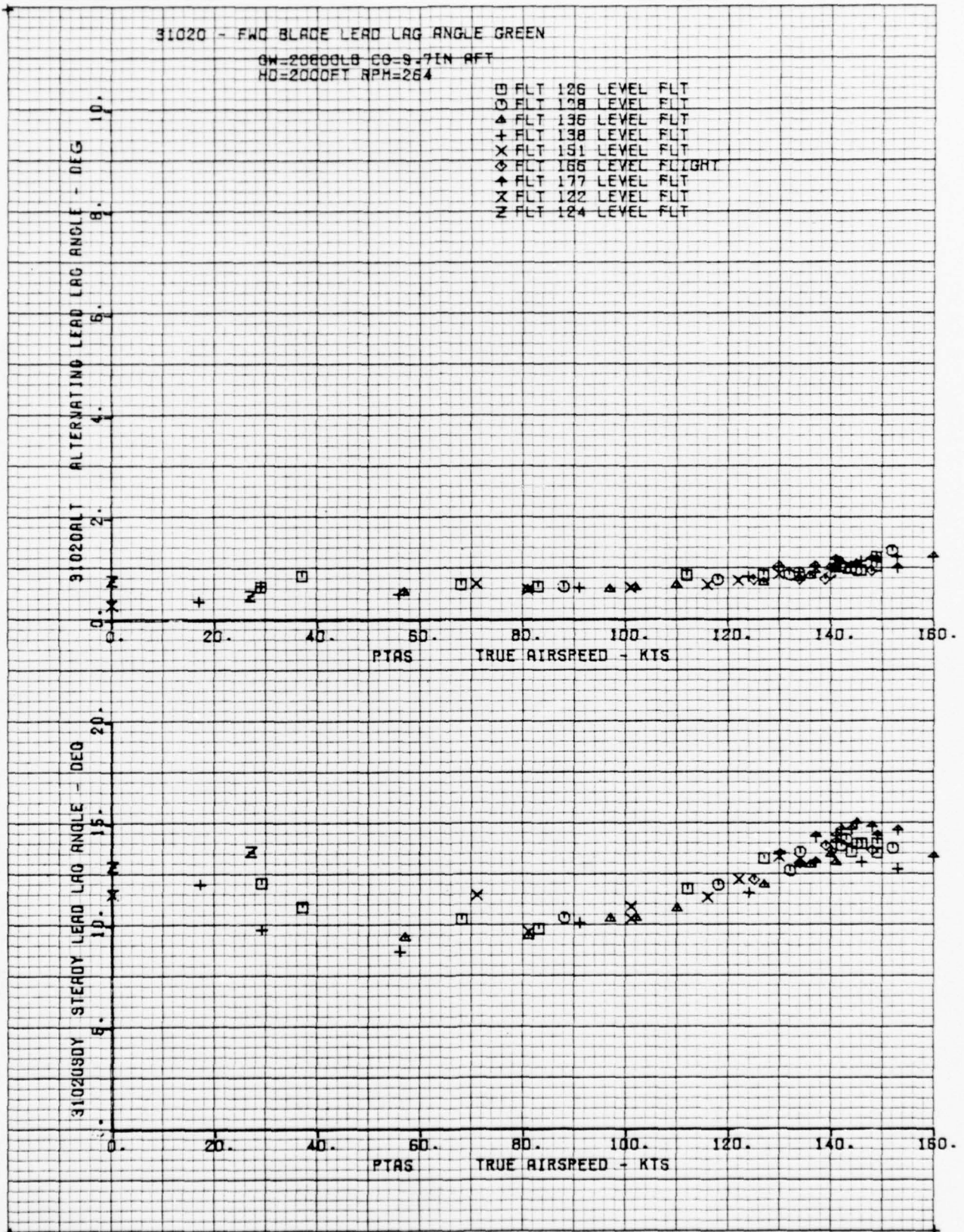


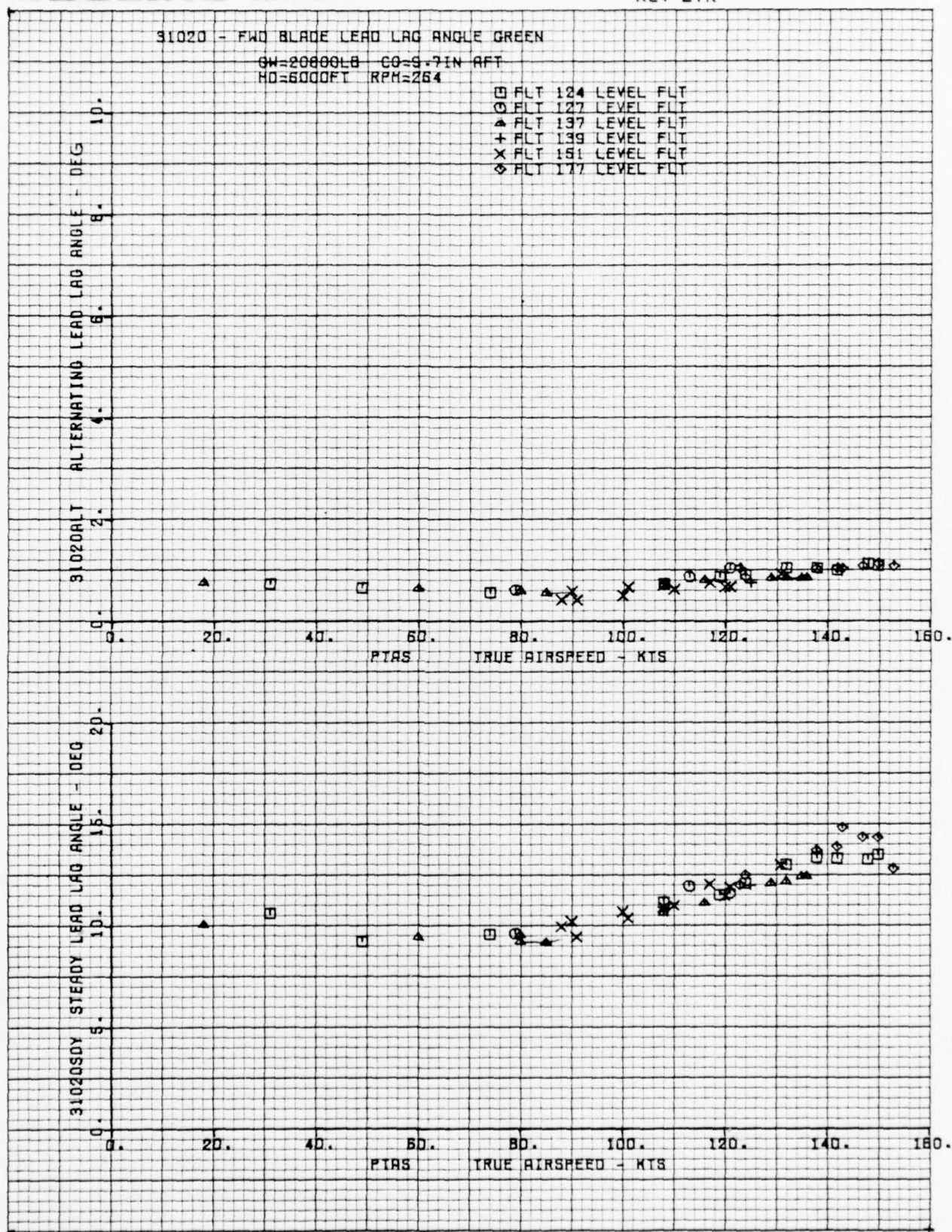


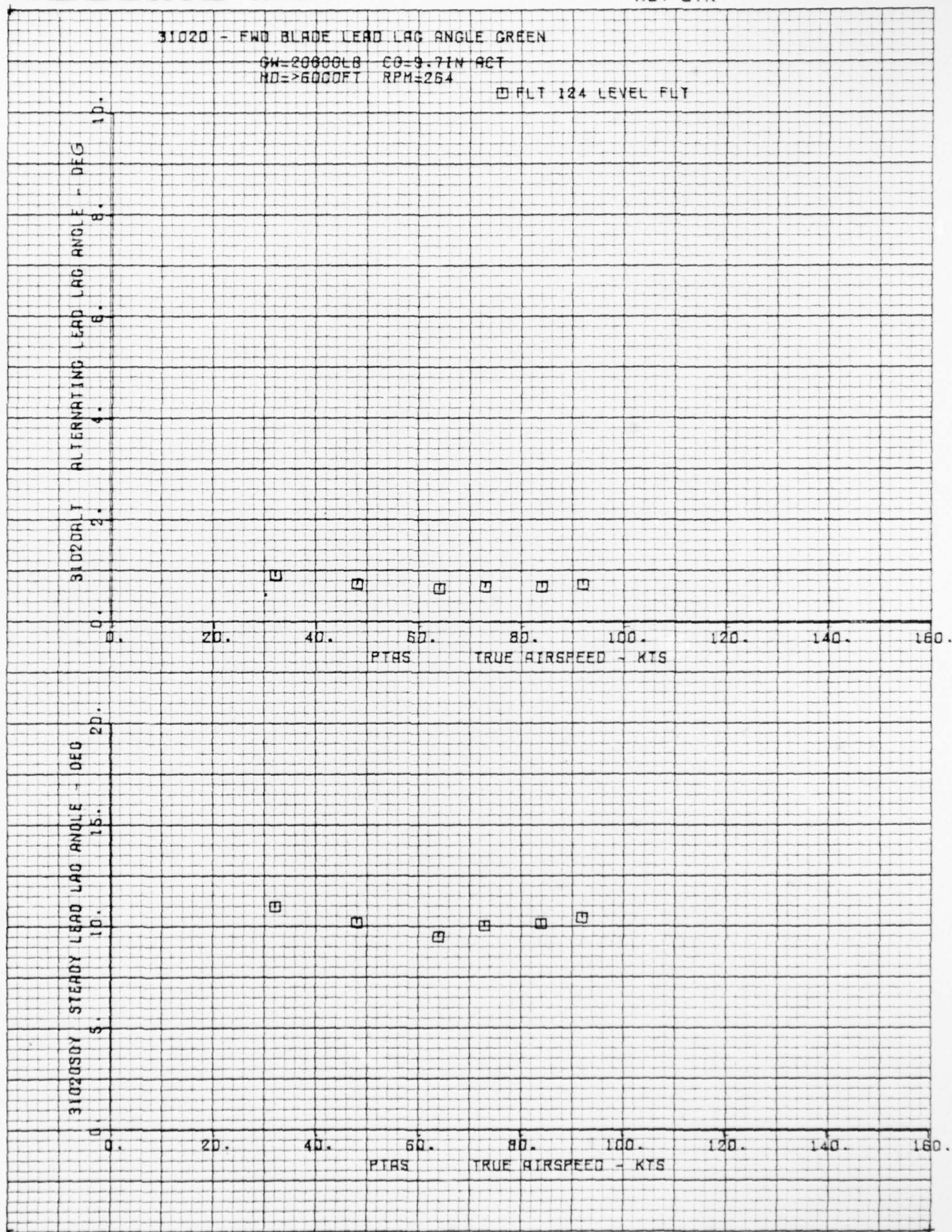




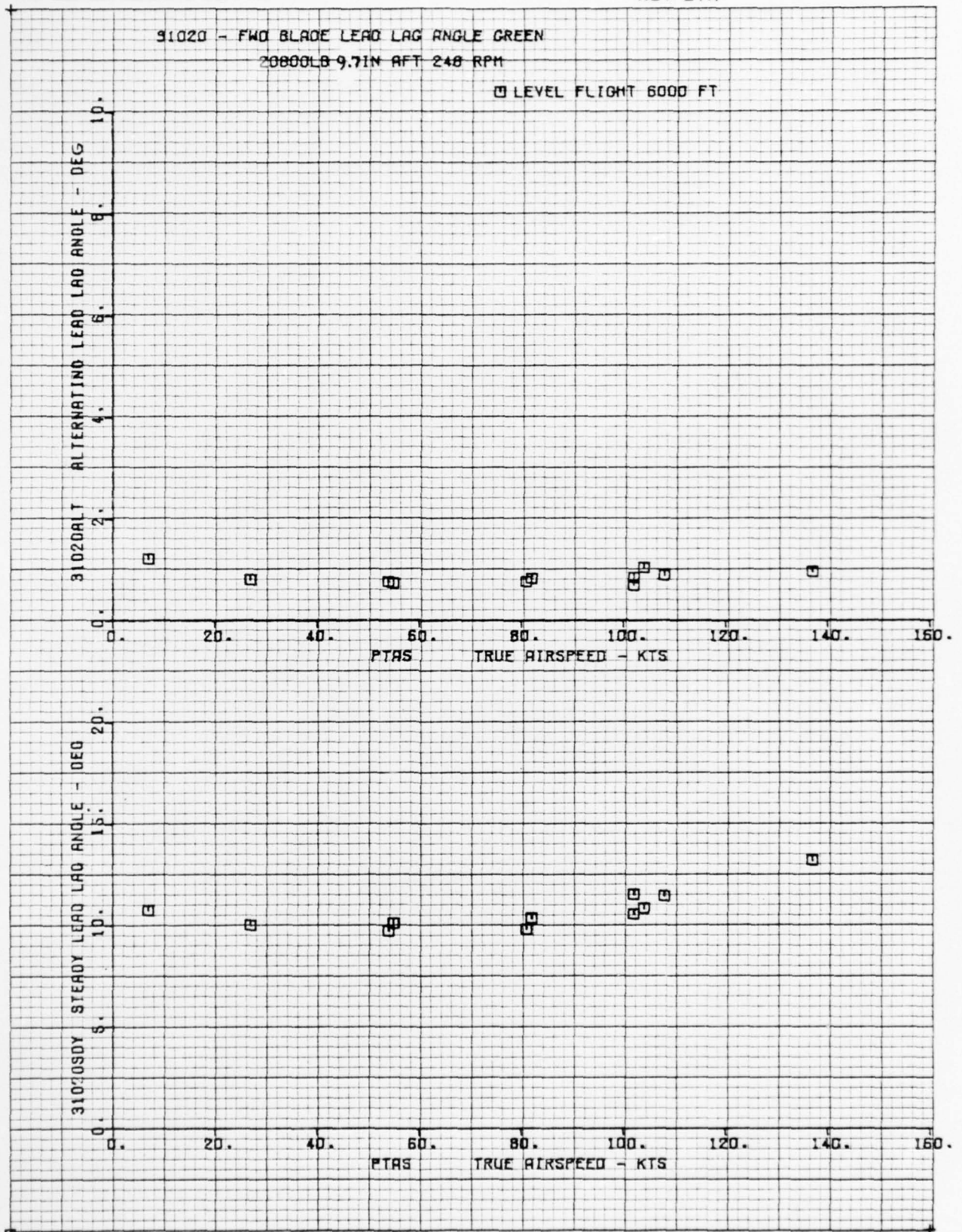




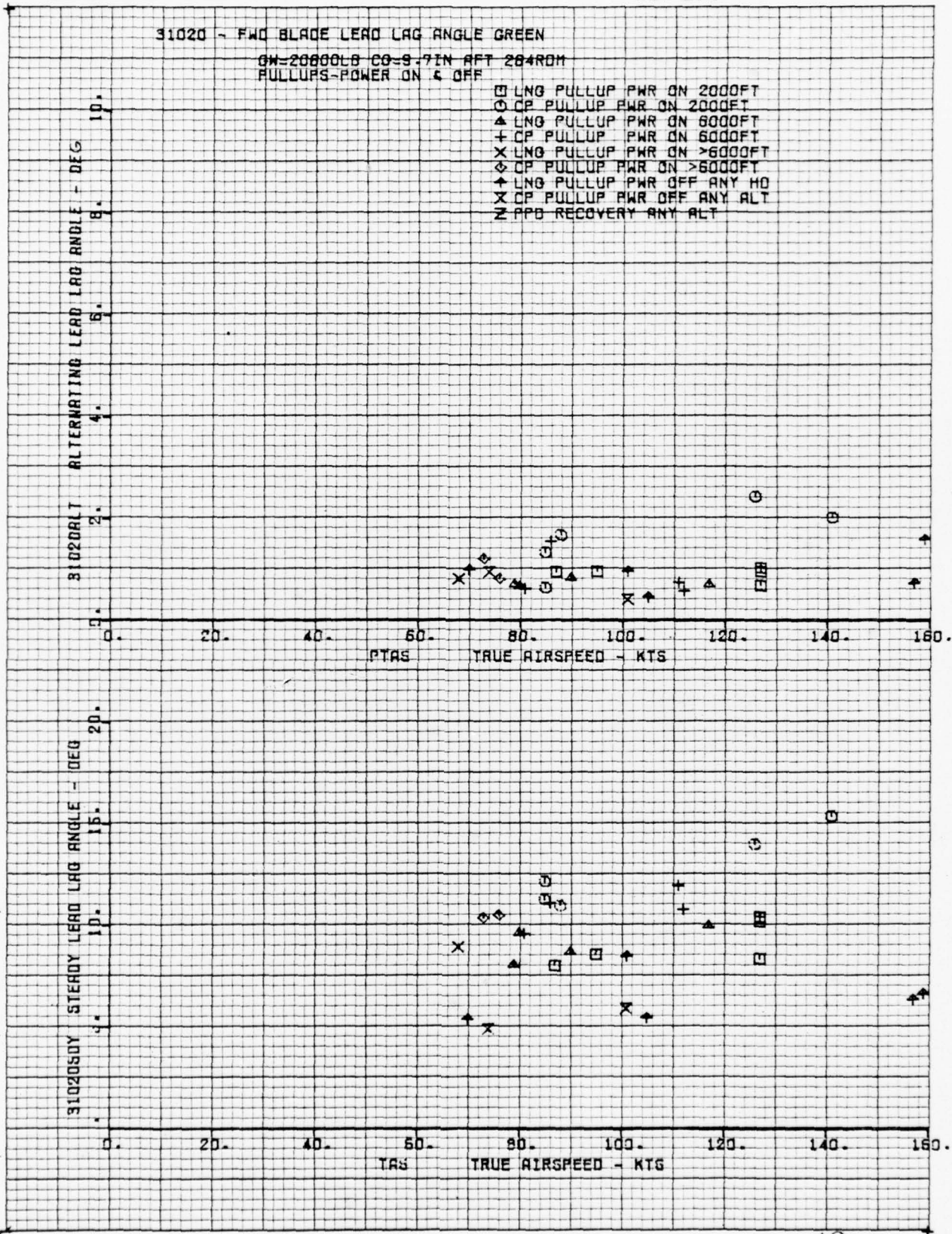


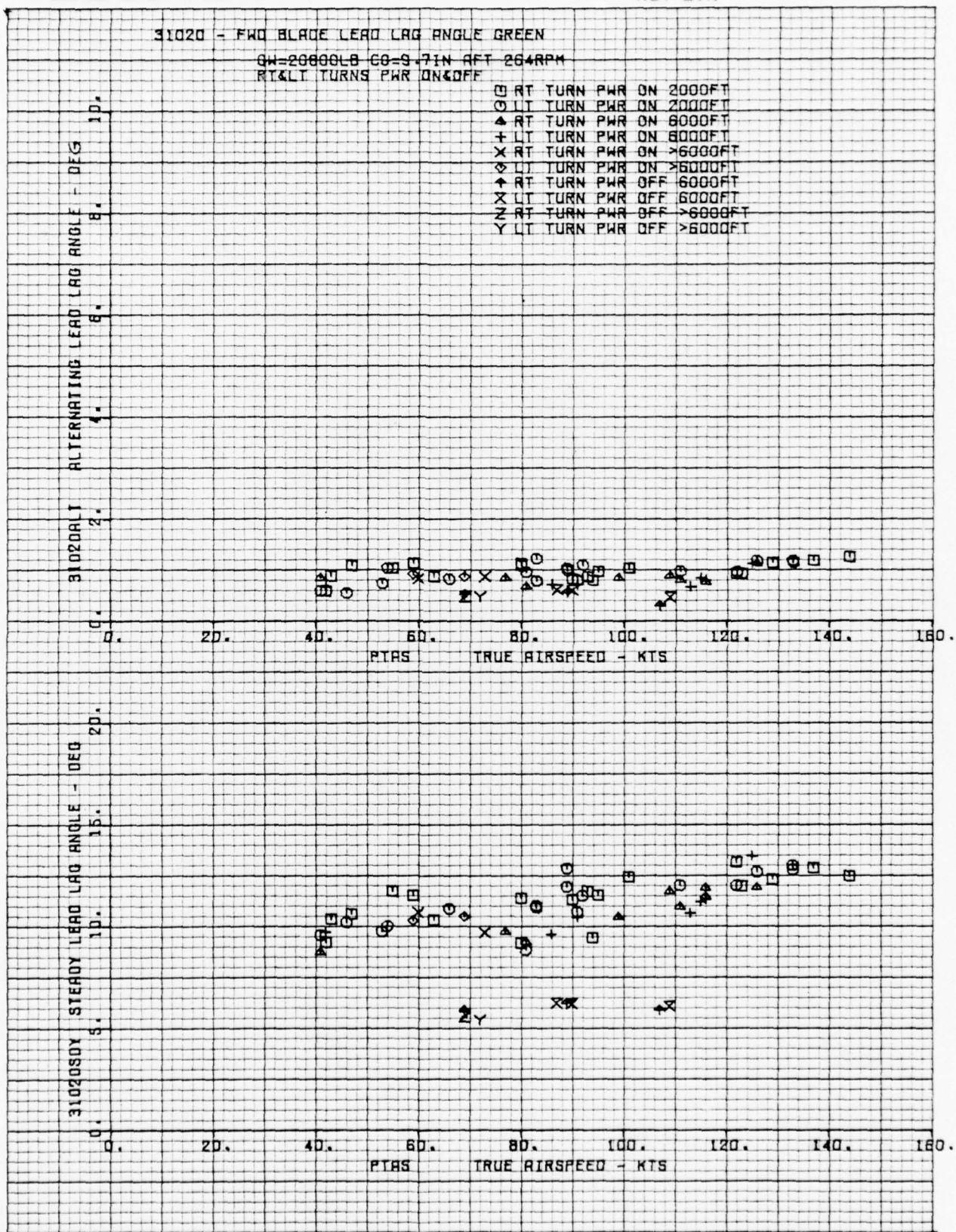


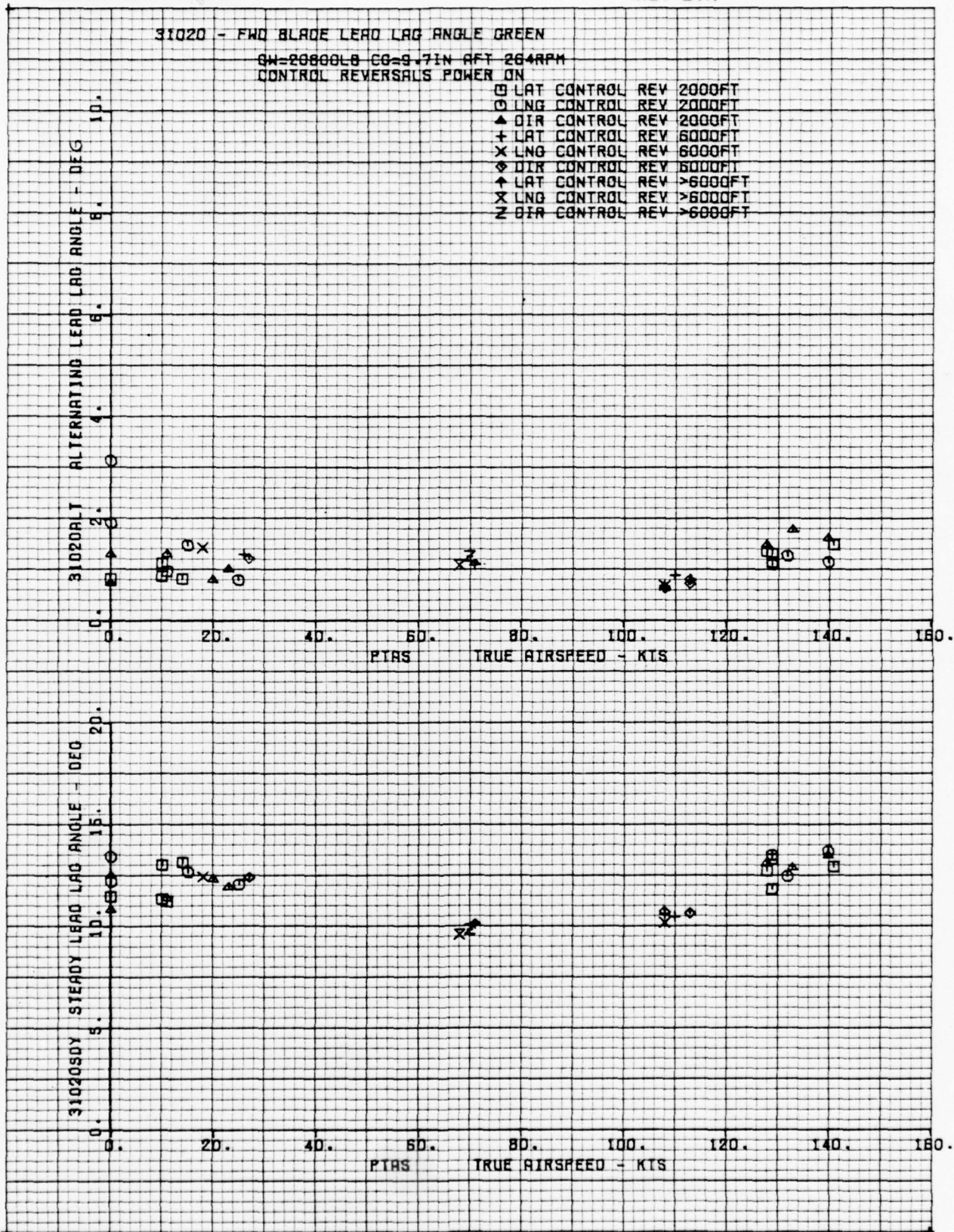
THE **BOEING** COMPANY

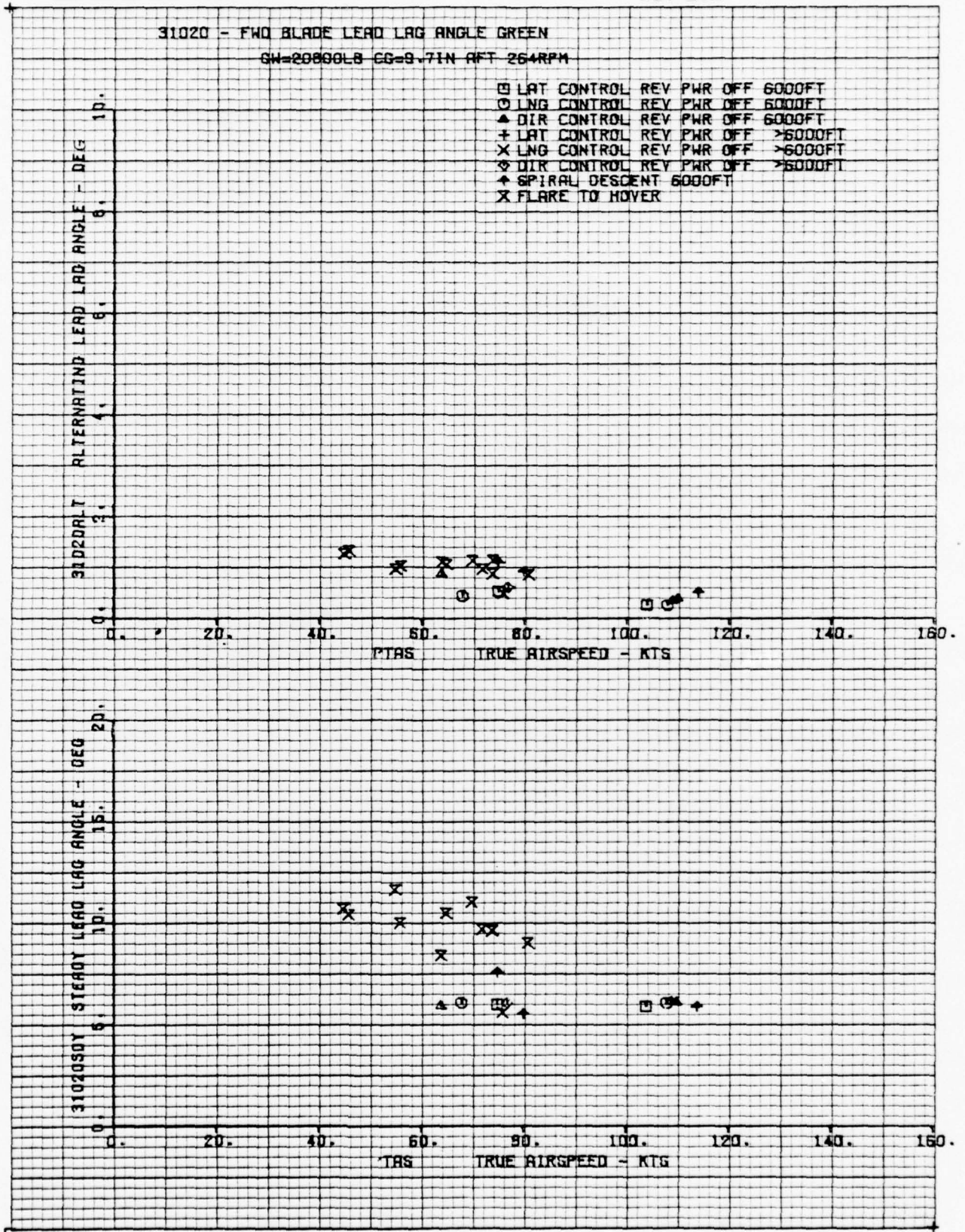


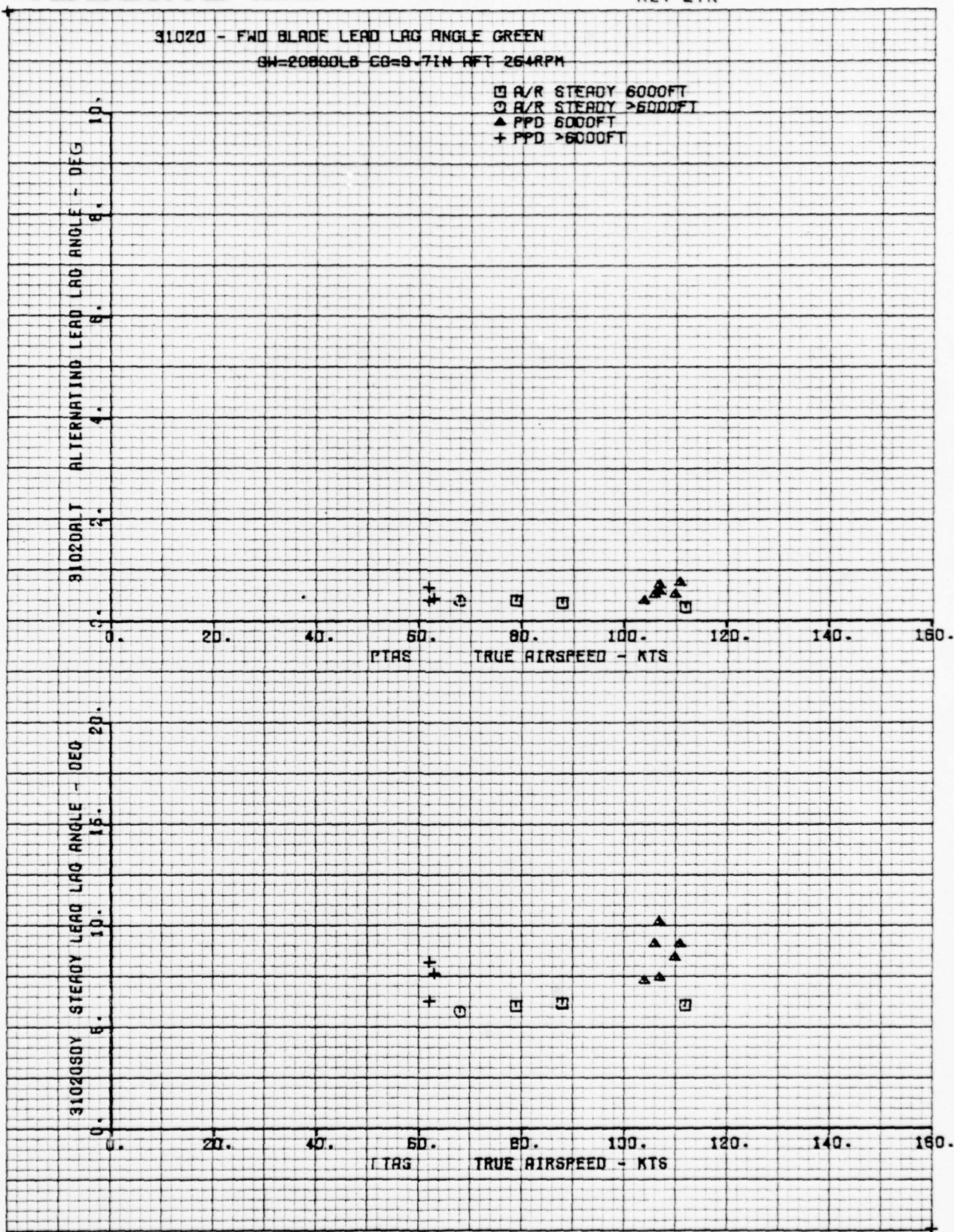
FORM 52300 (10/71)

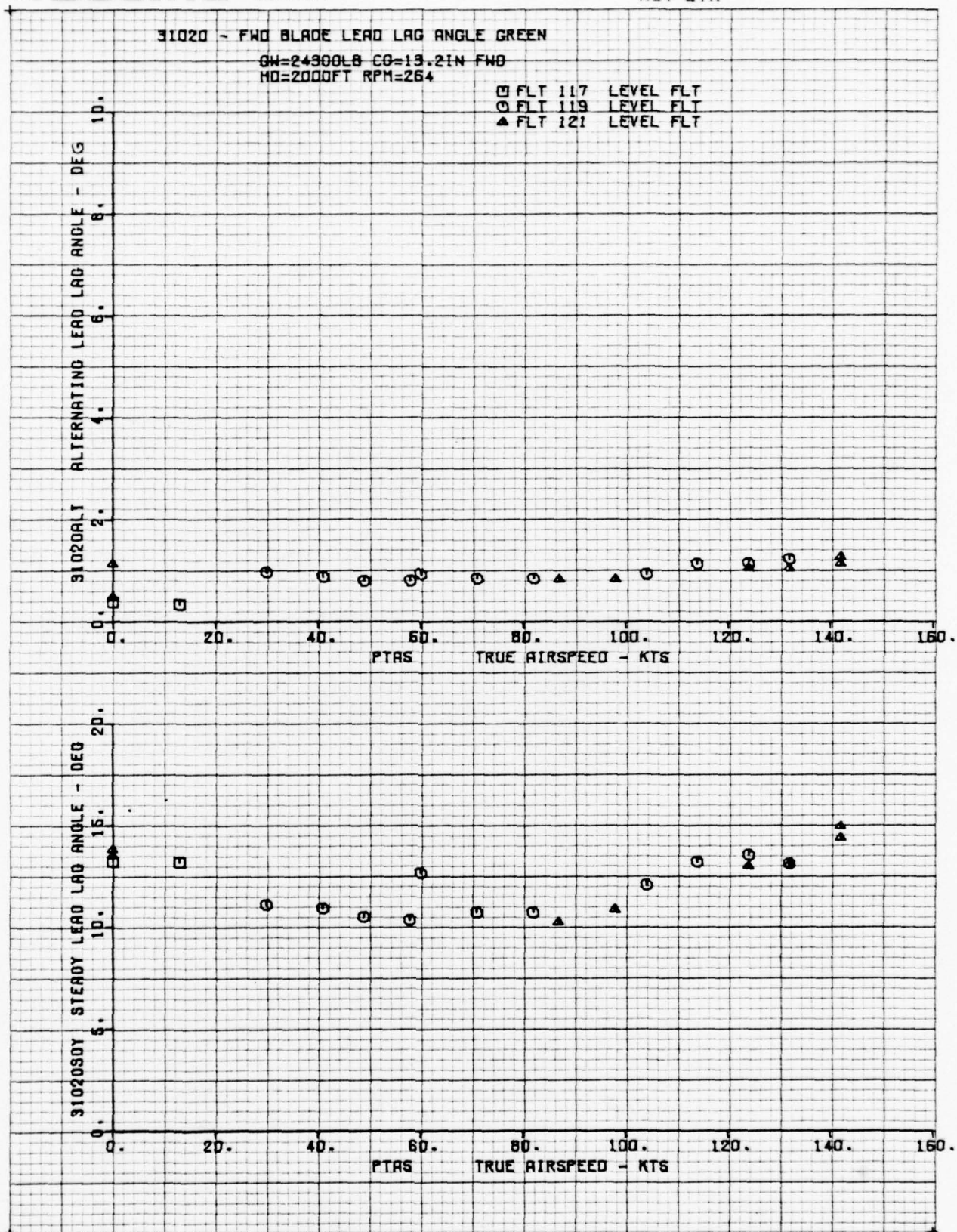


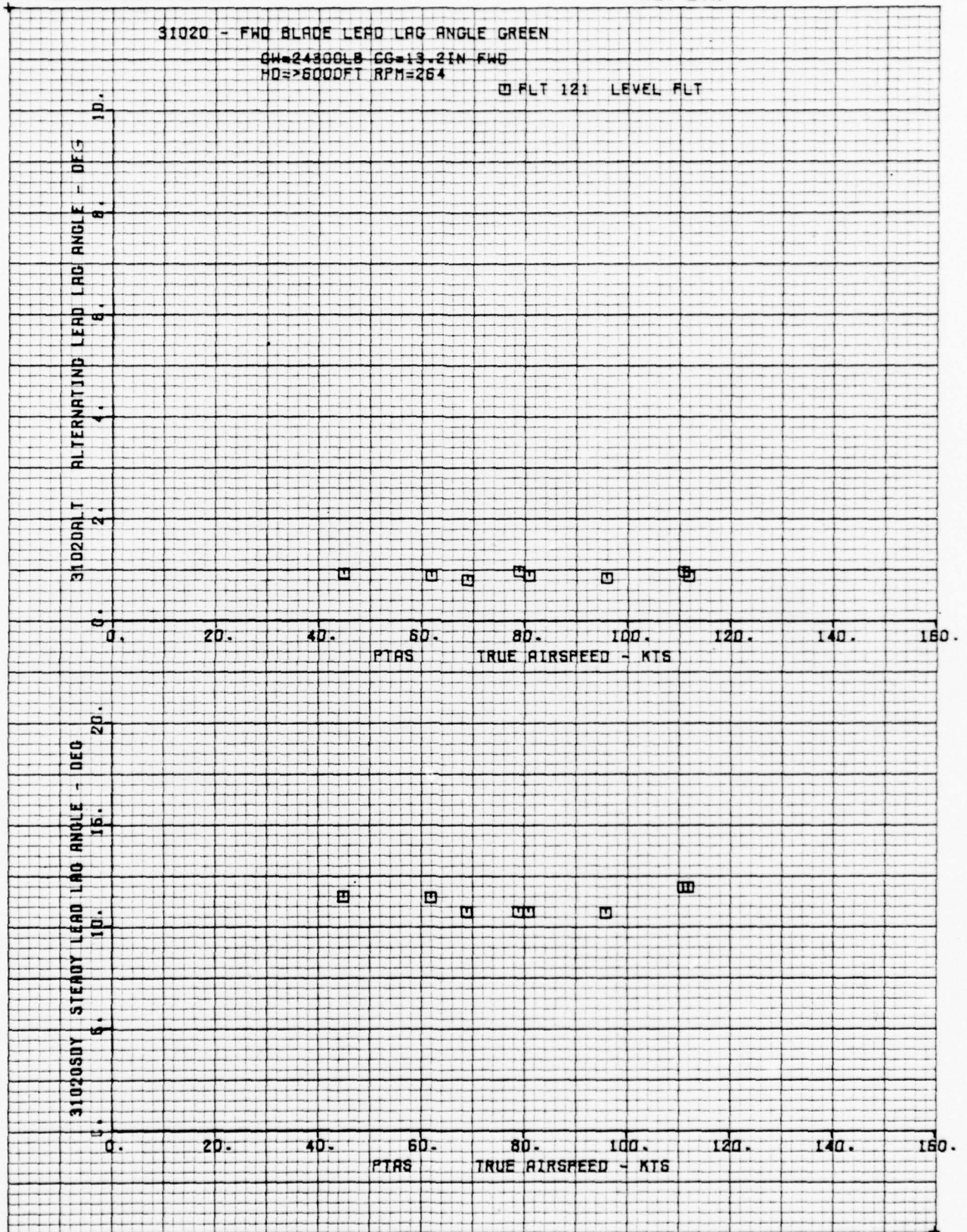












31020 - FWD BLADE LEAD LAG ANGLE GREEN

GW=24300LB CG=13.2IN FWD
POWER ON & OFF PULLUPS

- LONG PULLUP PWR ON 2000FT
- CP PULLUP PWR ON 2000FT
- ▲ LONG PULLUP PWR ON >6000FT
- + CP PULLUP PWR ON >6000FT
- x CP PULLUP PWR OFF 2000FT
- ◇ LONG PULLUP PWR OFF 2000FT
- ↑ LONG PULLUP PWR OFF >6000FT
- x CP PULLUP PWR OFF >6000FT

31020ALT ALTERNATING LEAD LAG ANGLE - DEG

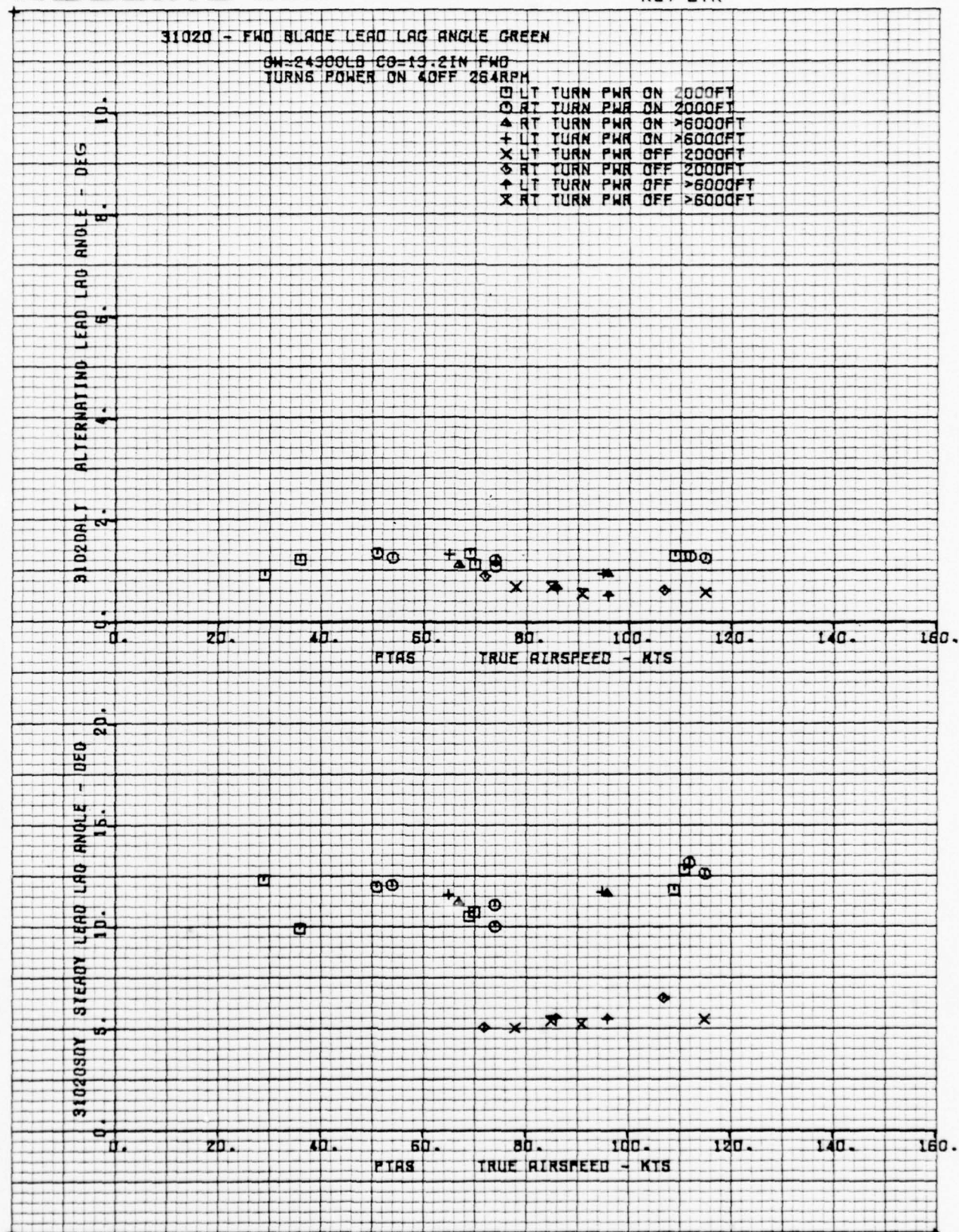
10.
8.
6.
4.
2.
0.

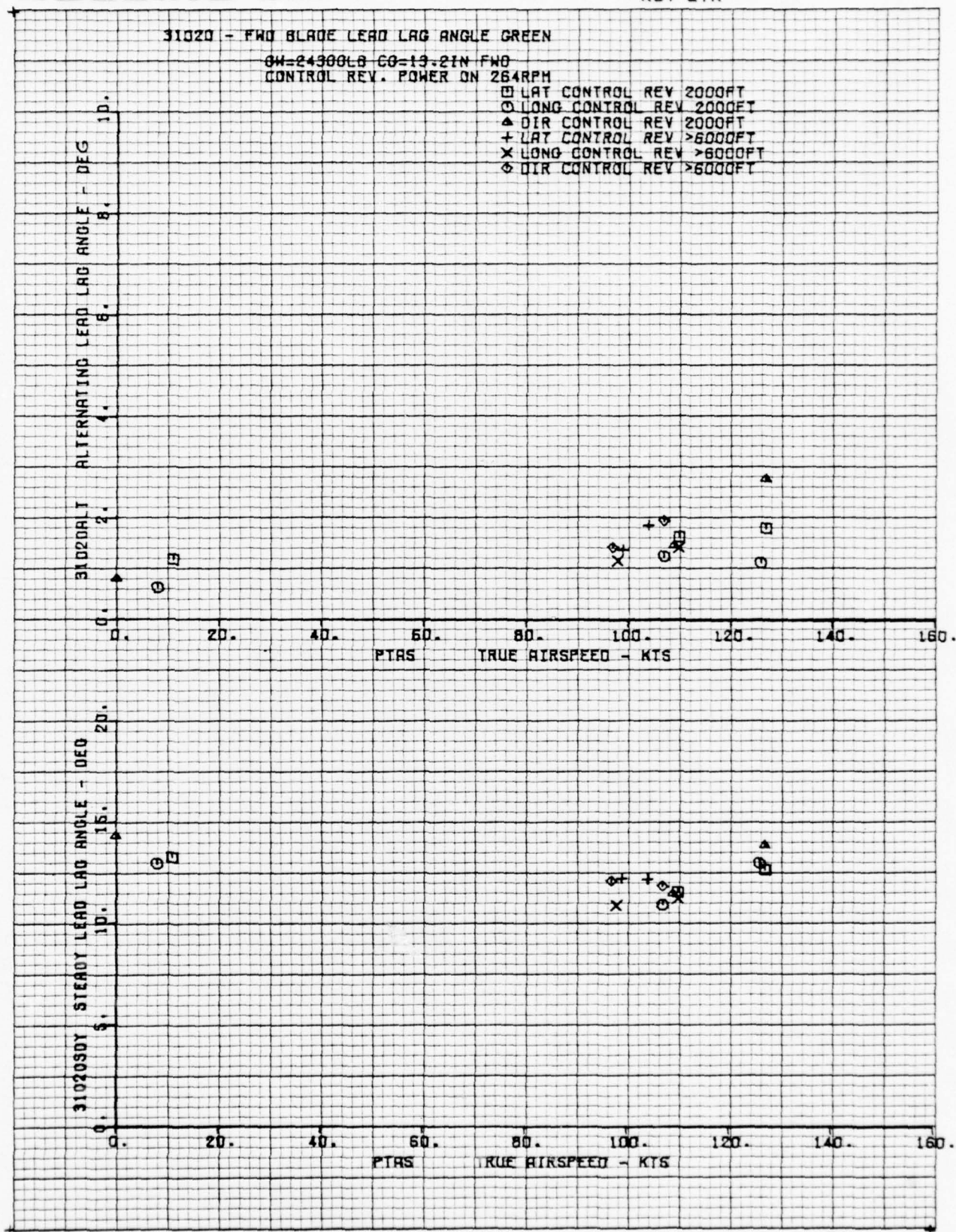
31020SDY STEADY LEAD LAG ANGLE - DEG

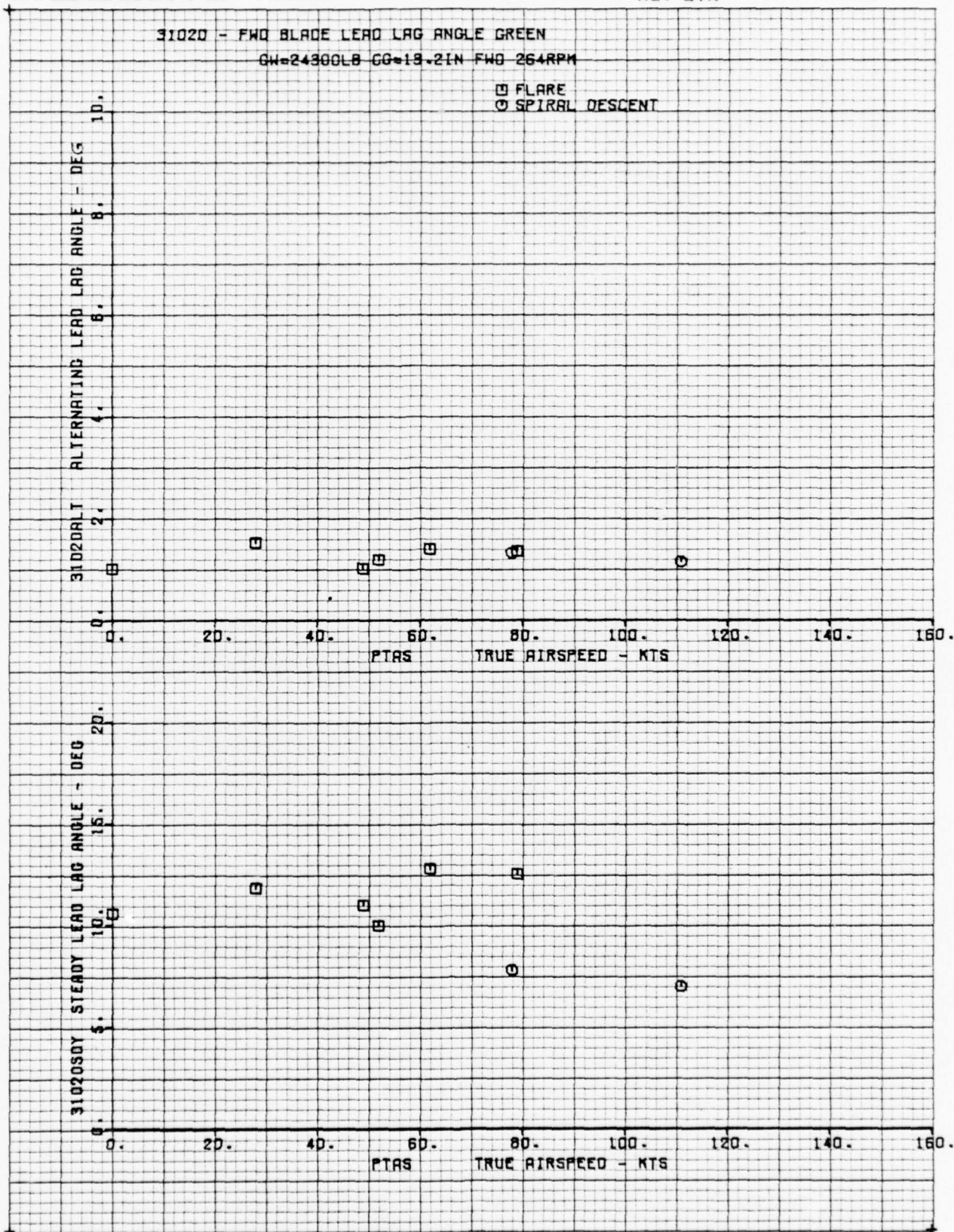
20.
15.
10.
5.
0.

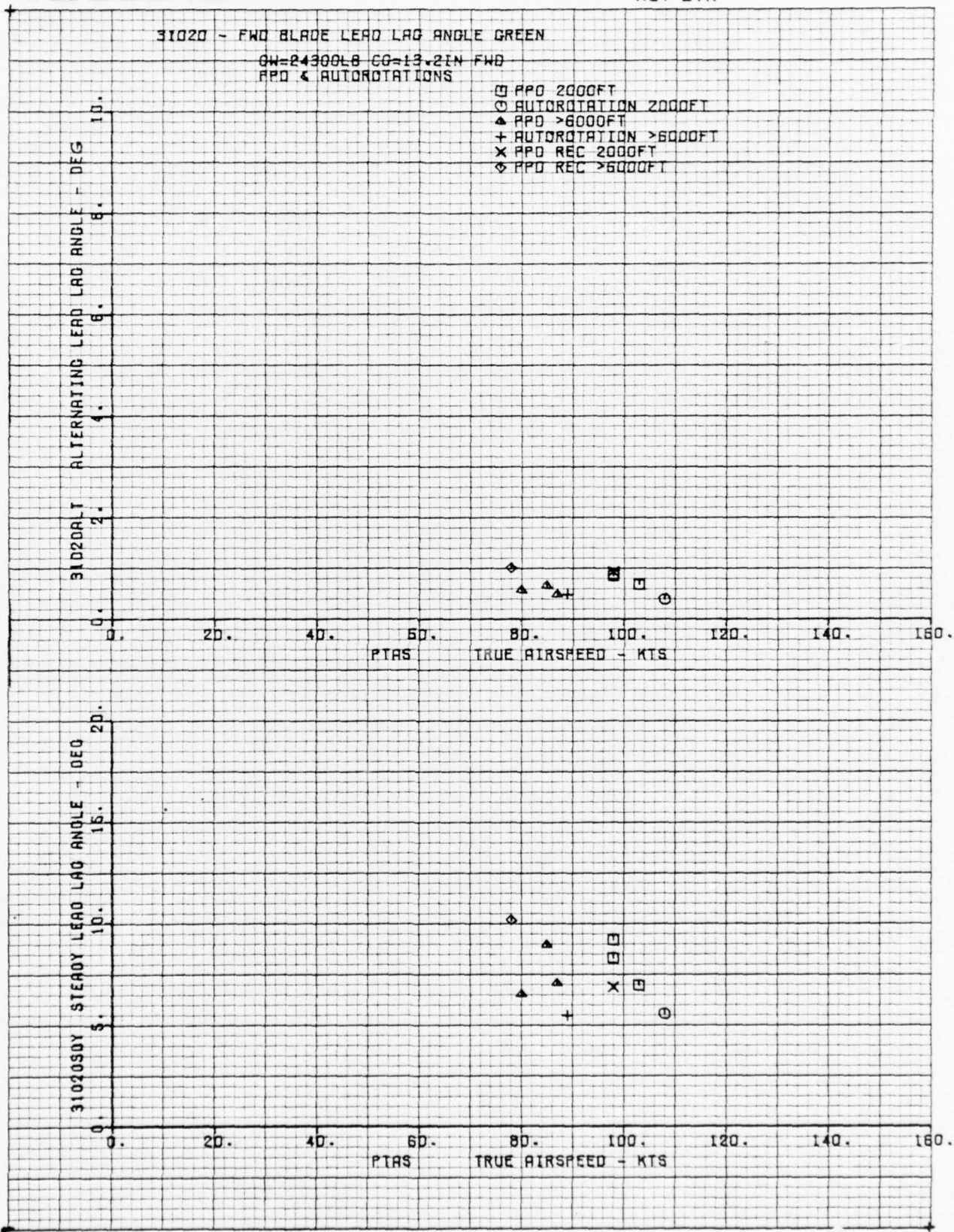
20. 40. 60. 80. 100. 120. 140. 160.
PTAS TRUE AIRSPEED - KTS

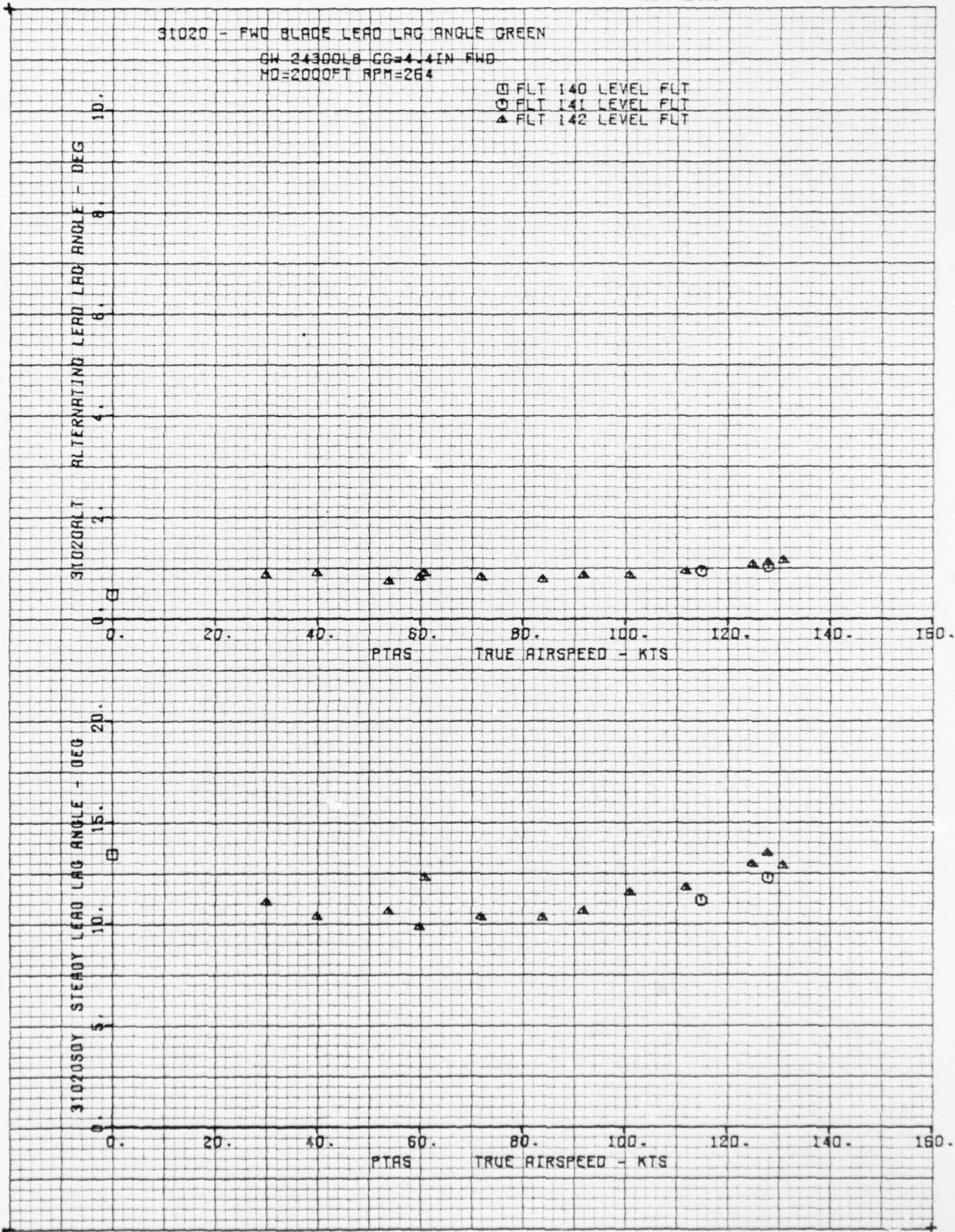
20. 40. 60. 80. 100. 120. 140. 160.
PTAS TRUE AIRSPEED - KTS

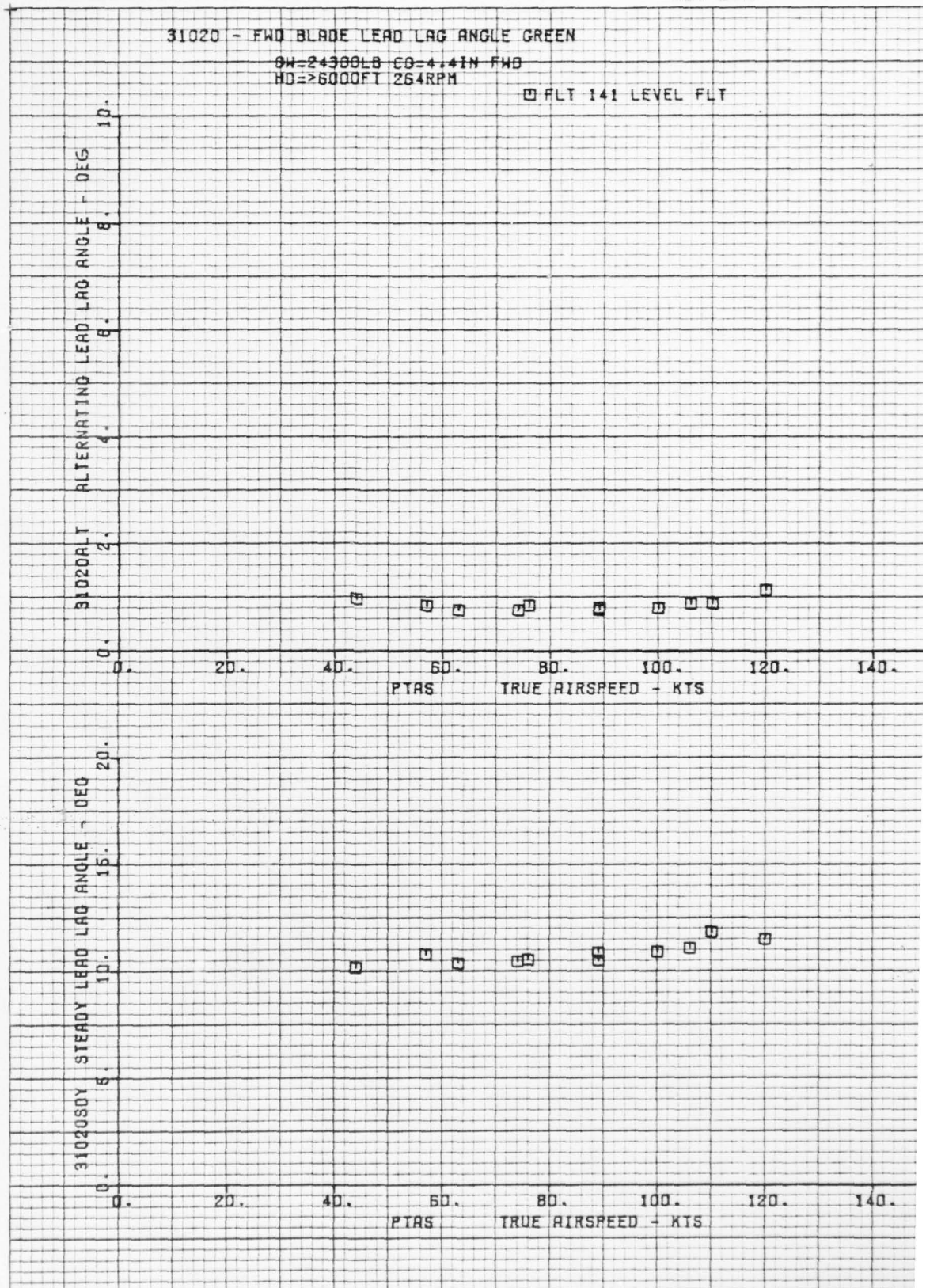


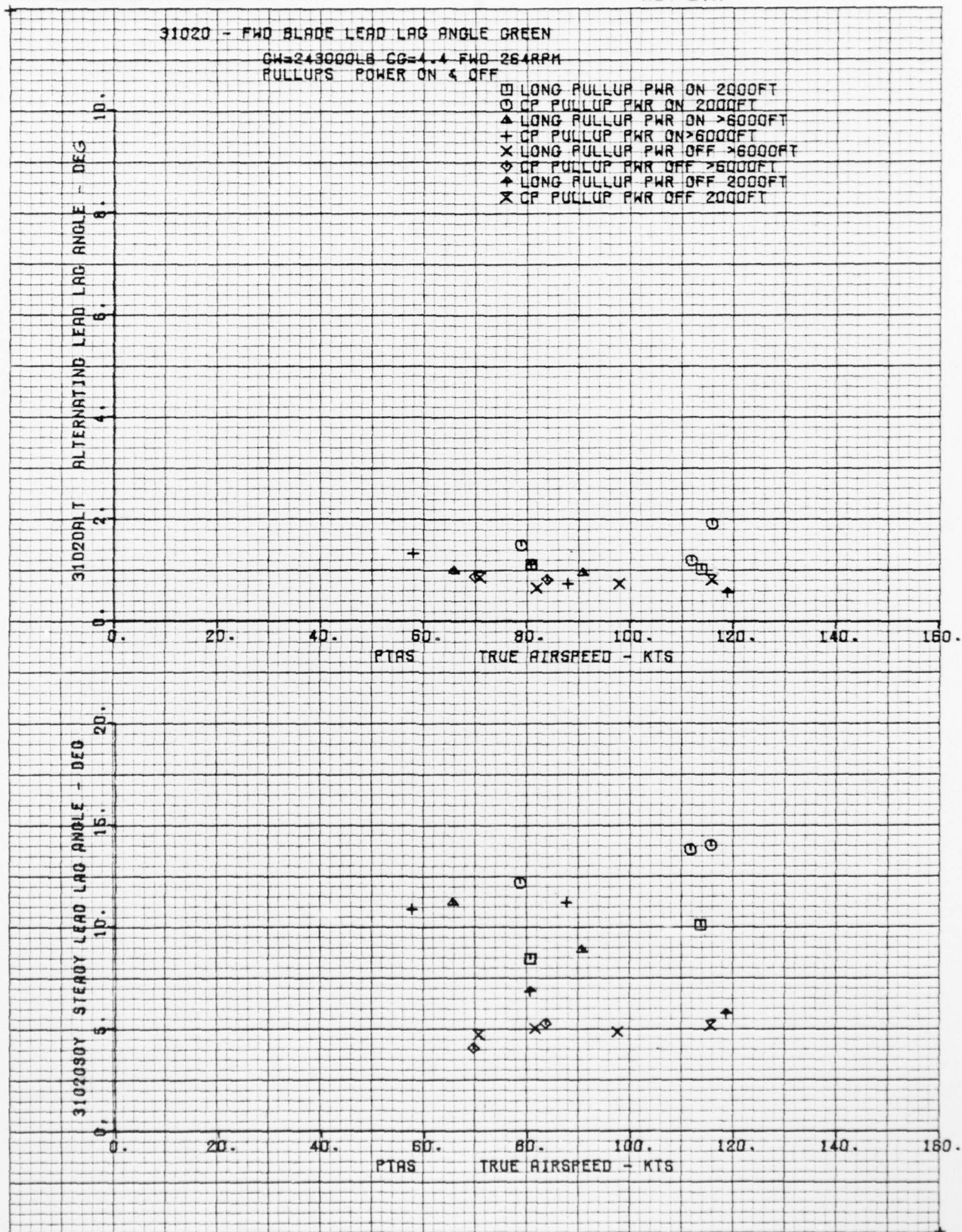










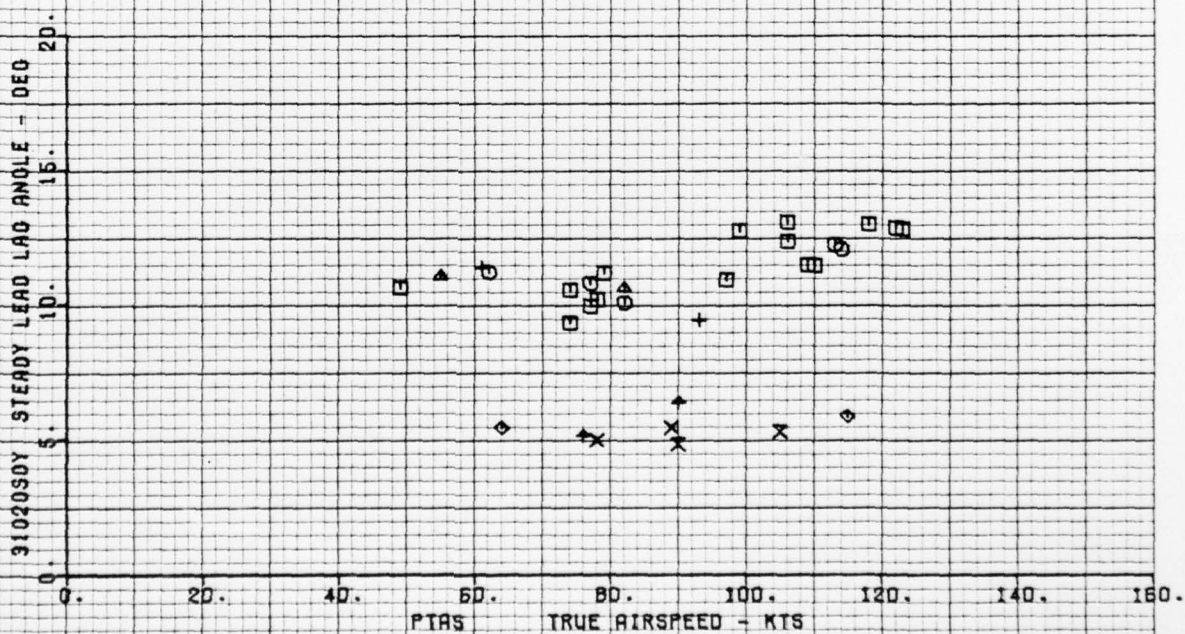
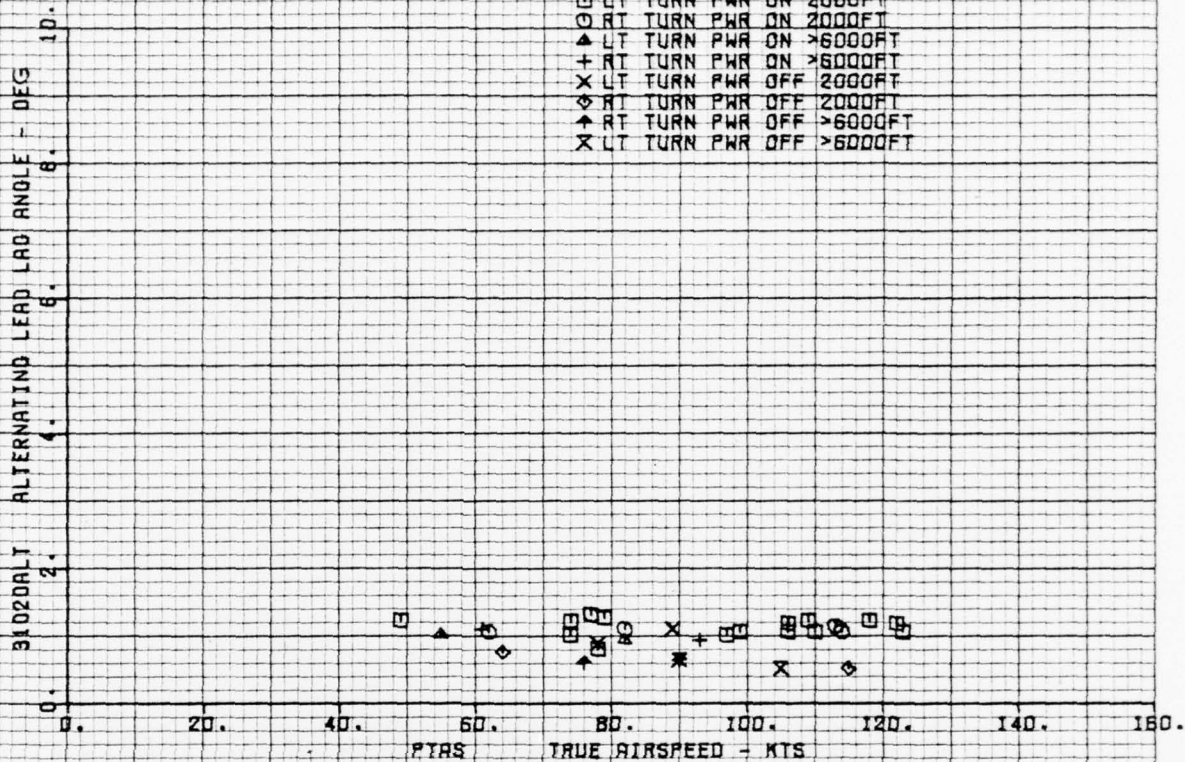


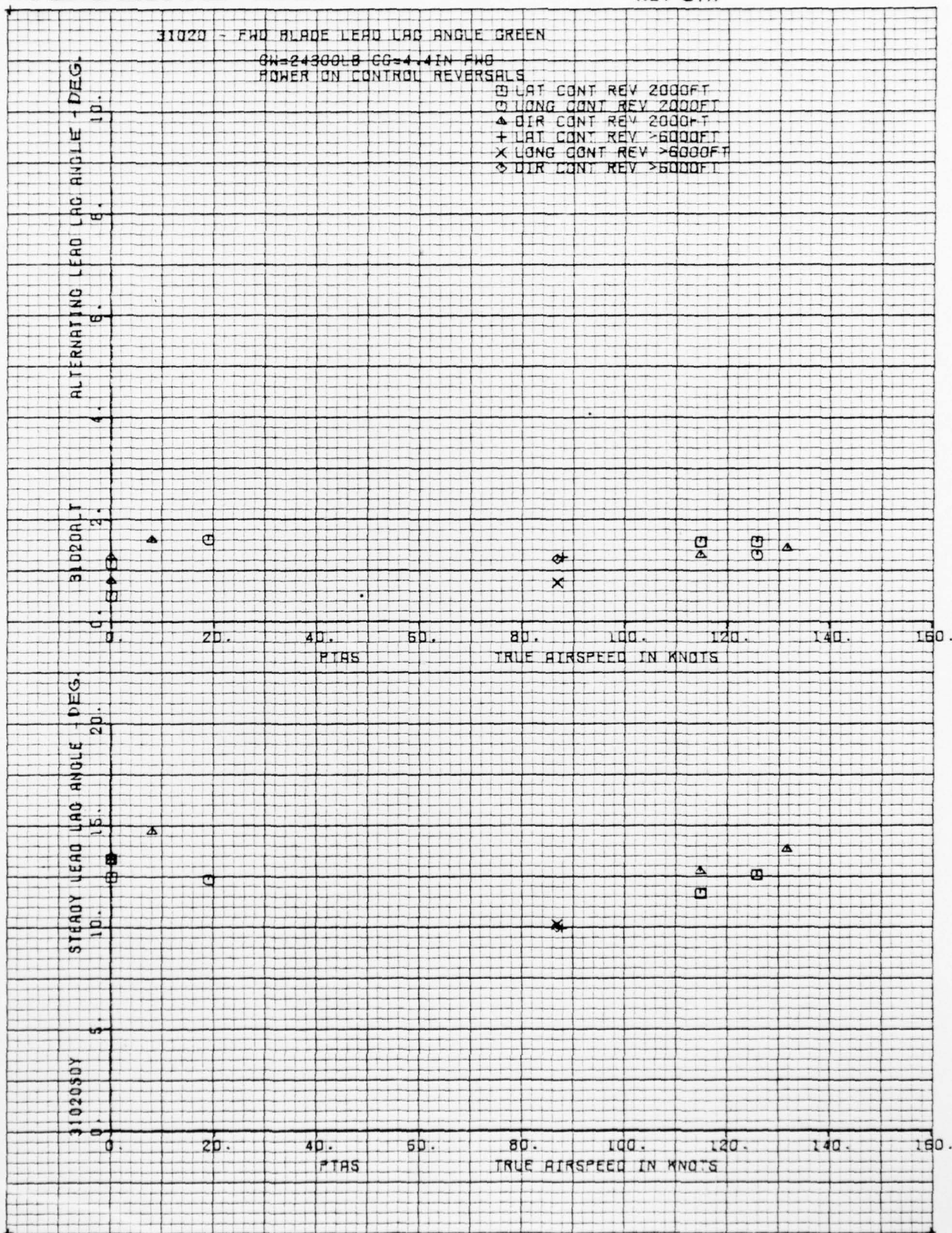
31020 - FWD BLADE LEAD LAG ANGLE GREEN

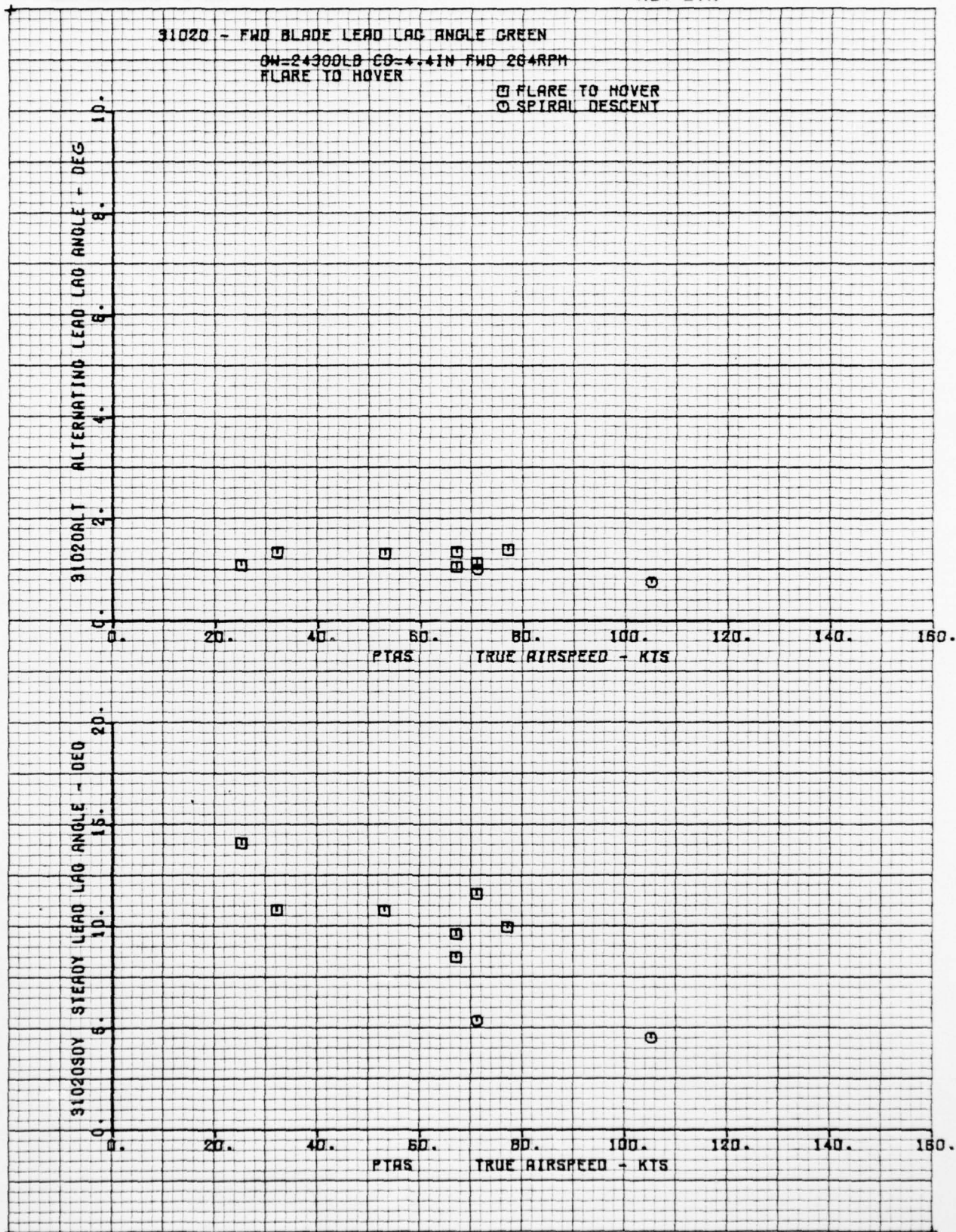
GW=24300LB CG=4.4 FWD

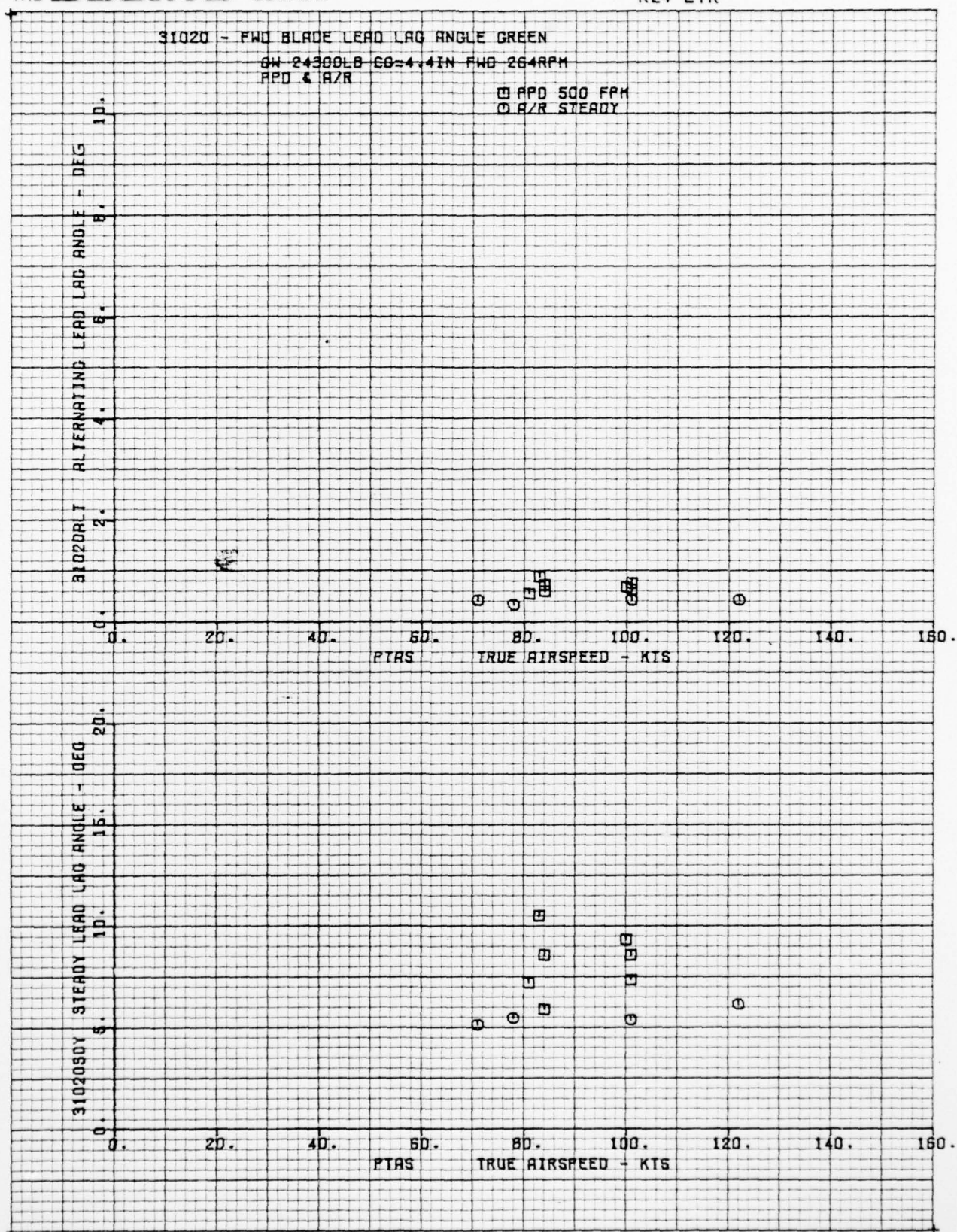
POWER ON & OFF TURNS 264RPM

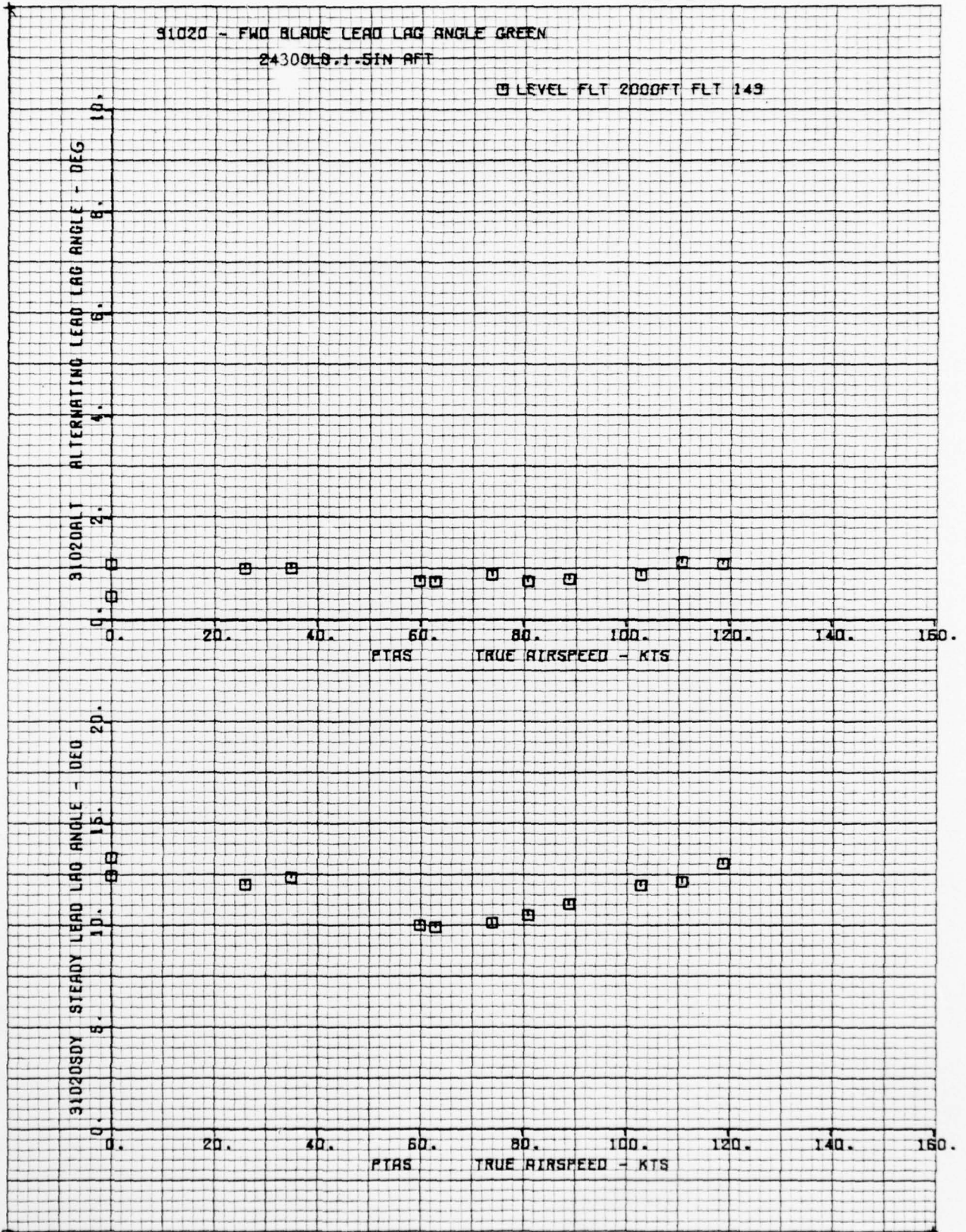
- LT TURN PWR ON 2000FT
- RT TURN PWR ON 2000FT
- △ LT TURN PWR ON >6000FT
- + RT TURN PWR ON >6000FT
- x LT TURN PWR OFF 2000FT
- ◇ RT TURN PWR OFF 2000FT
- ▲ RT TURN PWR OFF >6000FT
- x LT TURN PWR OFF >6000FT











THE **BOEING** COMPANY

PREPARED BY: J. Bendo

CHECKED BY:

DATE: 8/28/78

NUMBER D210-11168-3

REV LTR Volume 2

MODEL NO.

4.3 Forward Blade Pitch Angle

31030 - FWD BLADE PITCH ANGLE YELLOW

GW=20000LB CG=22.4IN FWD
HD=2000FT RPM=264

□ FLT 114 LVL FLT
+ FLT 115 LVL FLT
○ FLT 161 LVL FLT
△ FLT 162 LVL FLT

31030ALY ALTERNATING PITCH ANGLE - DEG

25.
20.
15.
10.
5.
0.

PTAS

TRUE AIRSPEED - KTS

31030SDY STEADY PITCH ANGLE - DEG

20.
15.
10.
5.
0.

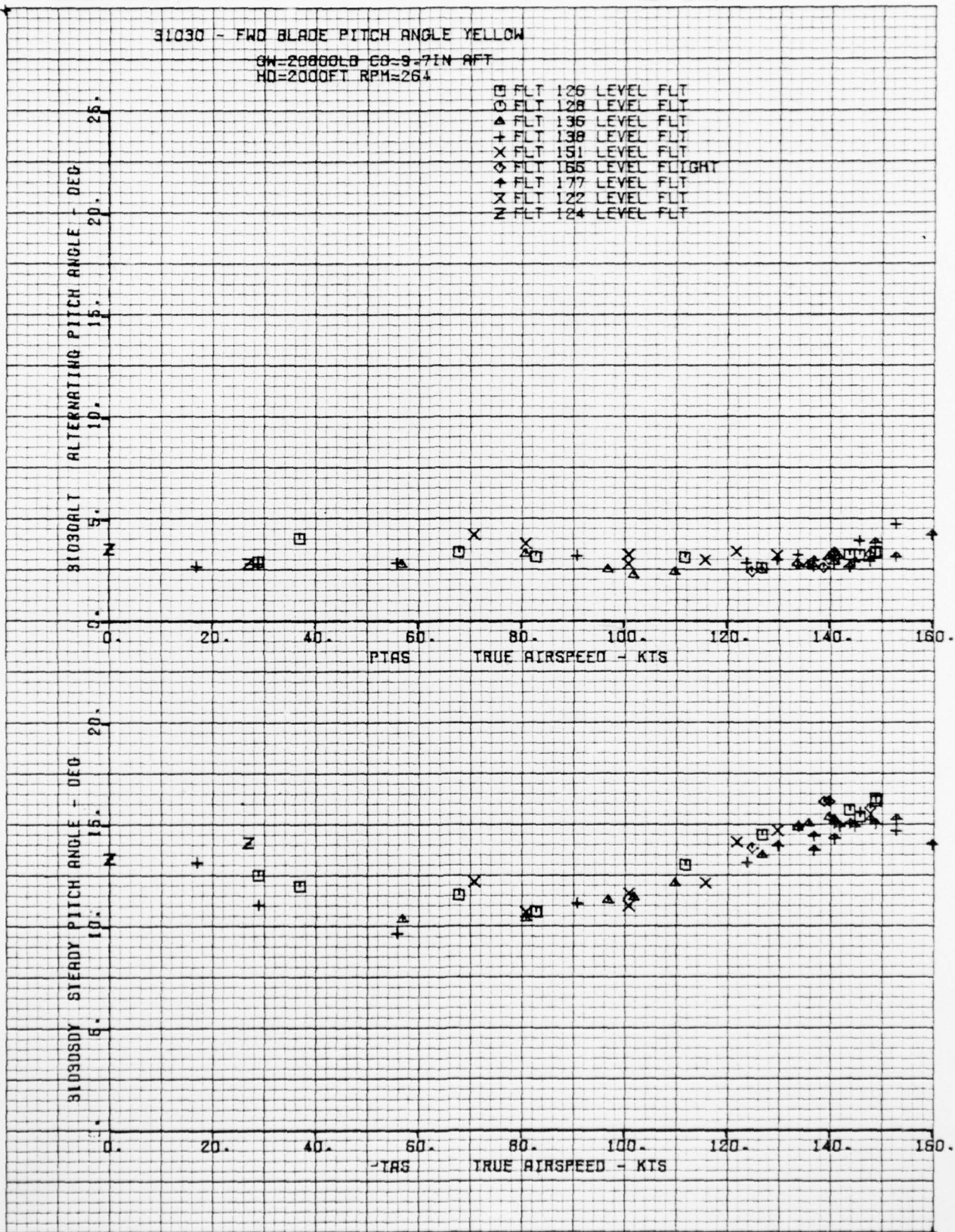
PTAS

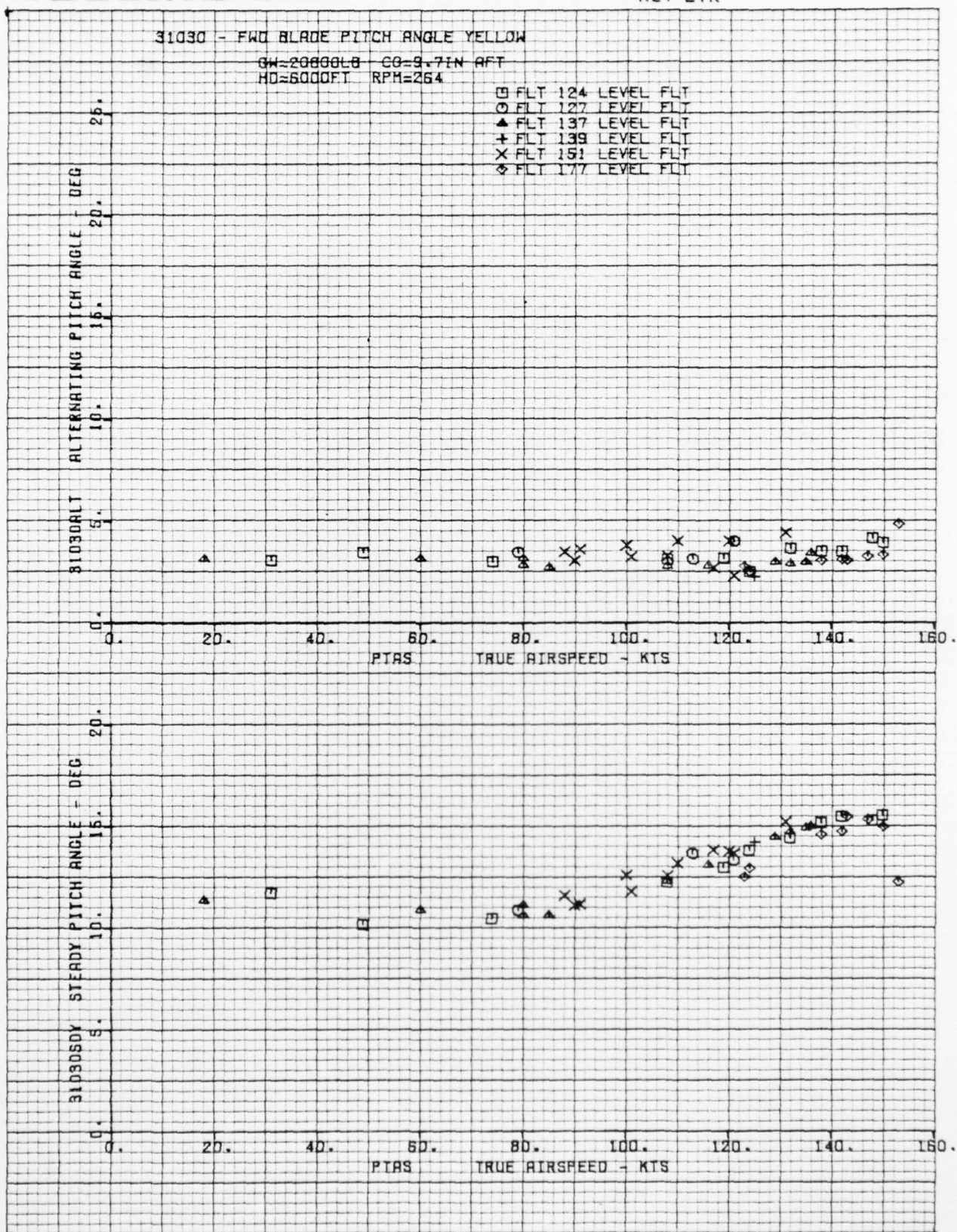
TRUE AIRSPEED - KTS

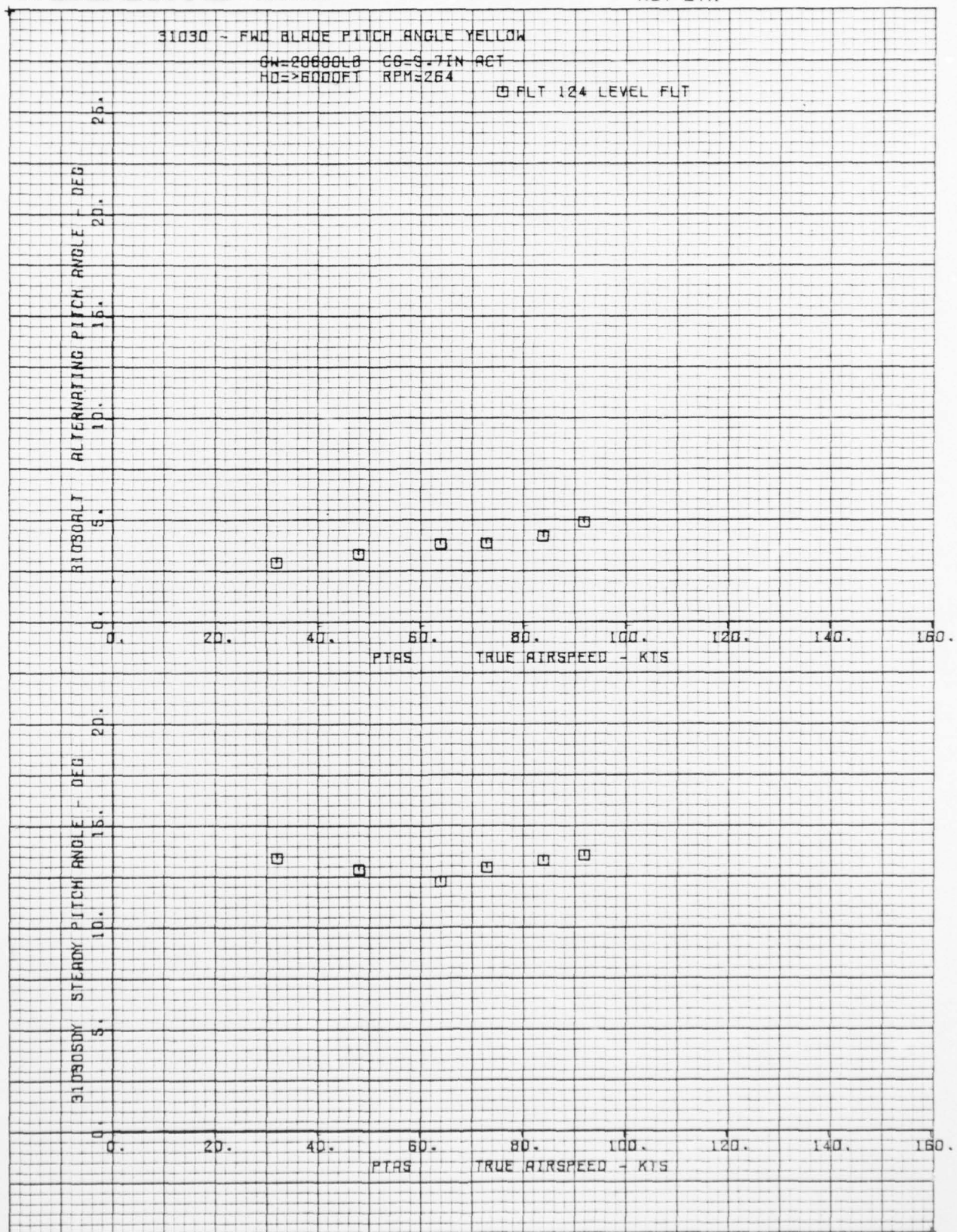
31030 - FWD BLADE PITCH ANGLE

GAGE INOPERATIVE

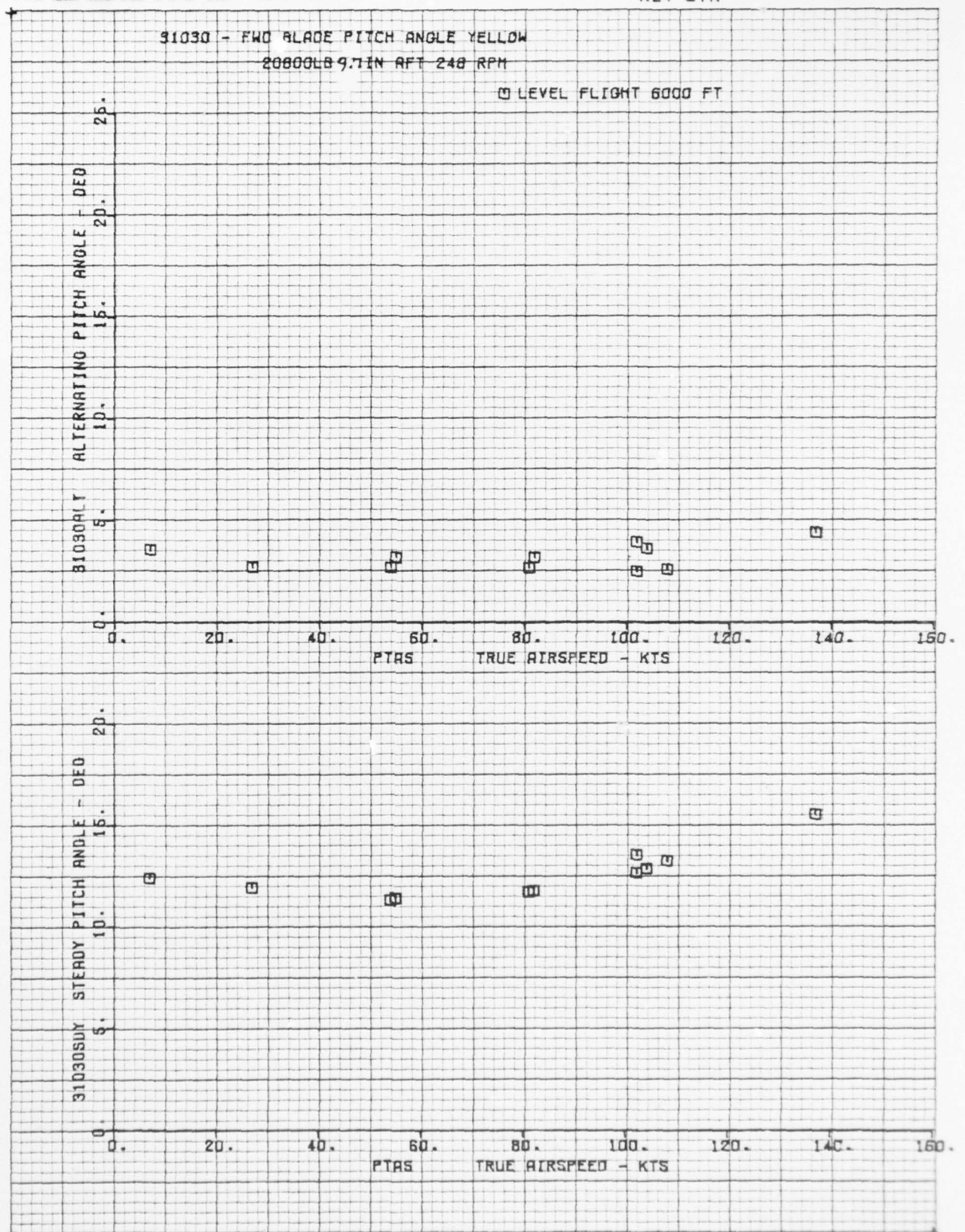
For Plot Numbers -2, -11, -15, -19, -23, and -27.





NUMBER
REV LTRTHE **BOEING** COMPANY

FORM 52300 (10/71)

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FORM 52300 (10/71)

AD-A075 570

BOEING VERTOL CO PHILADELPHIA PA

F/6 1/3

CH-46 COMPOSITE ROTOR BLADE FLIGHT STRESS SURVEY DATA. VOLUME I--ETC(U)

1978 R AIELLO, J BENDO

N00019-75-C-0396

UNCLASSIFIED

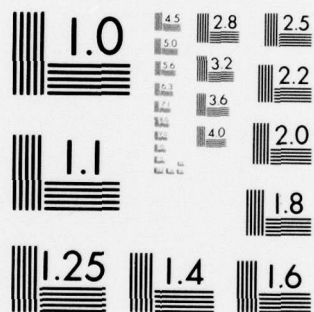
D210-11168-3-VOL-2

NL

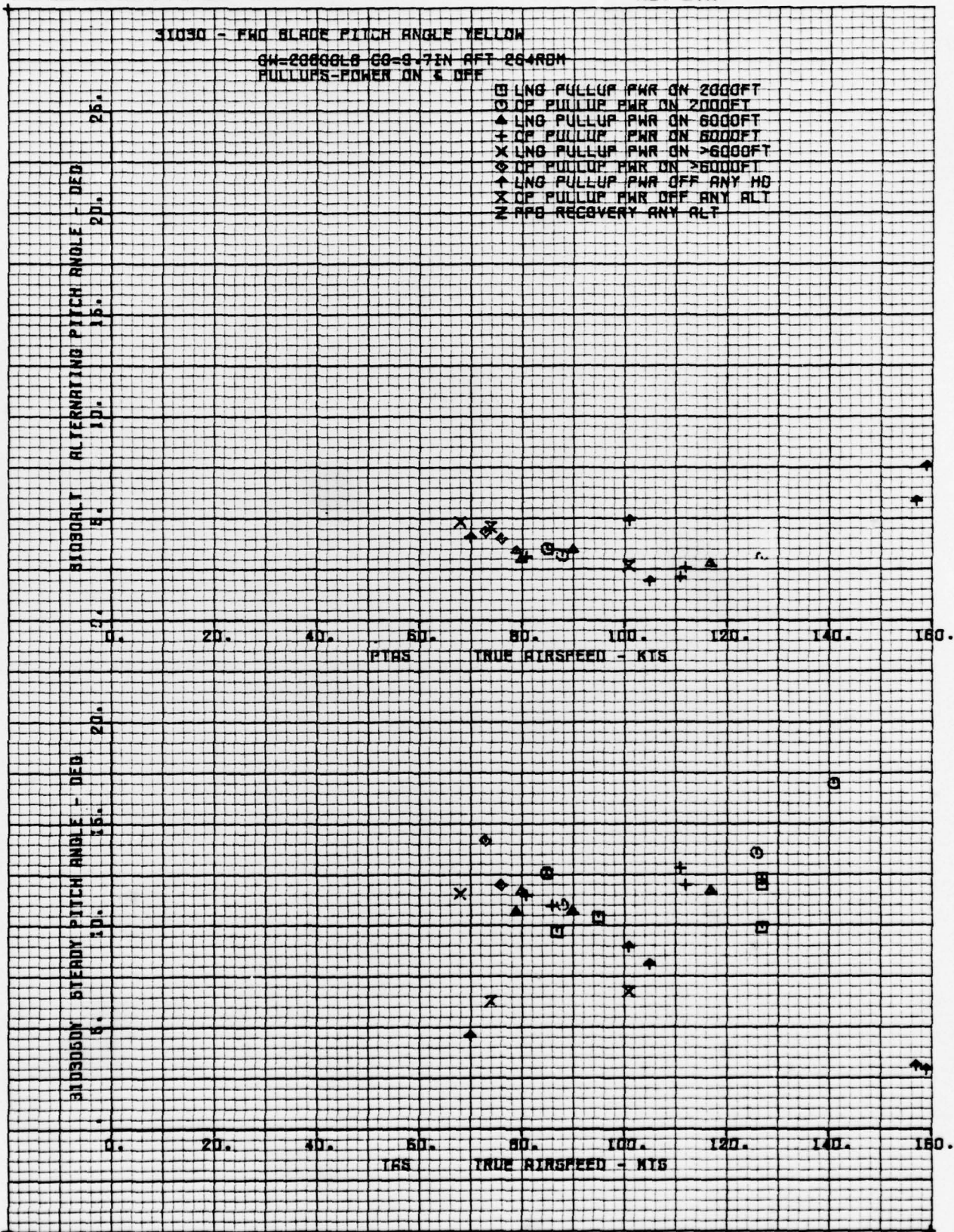
2 OF 4

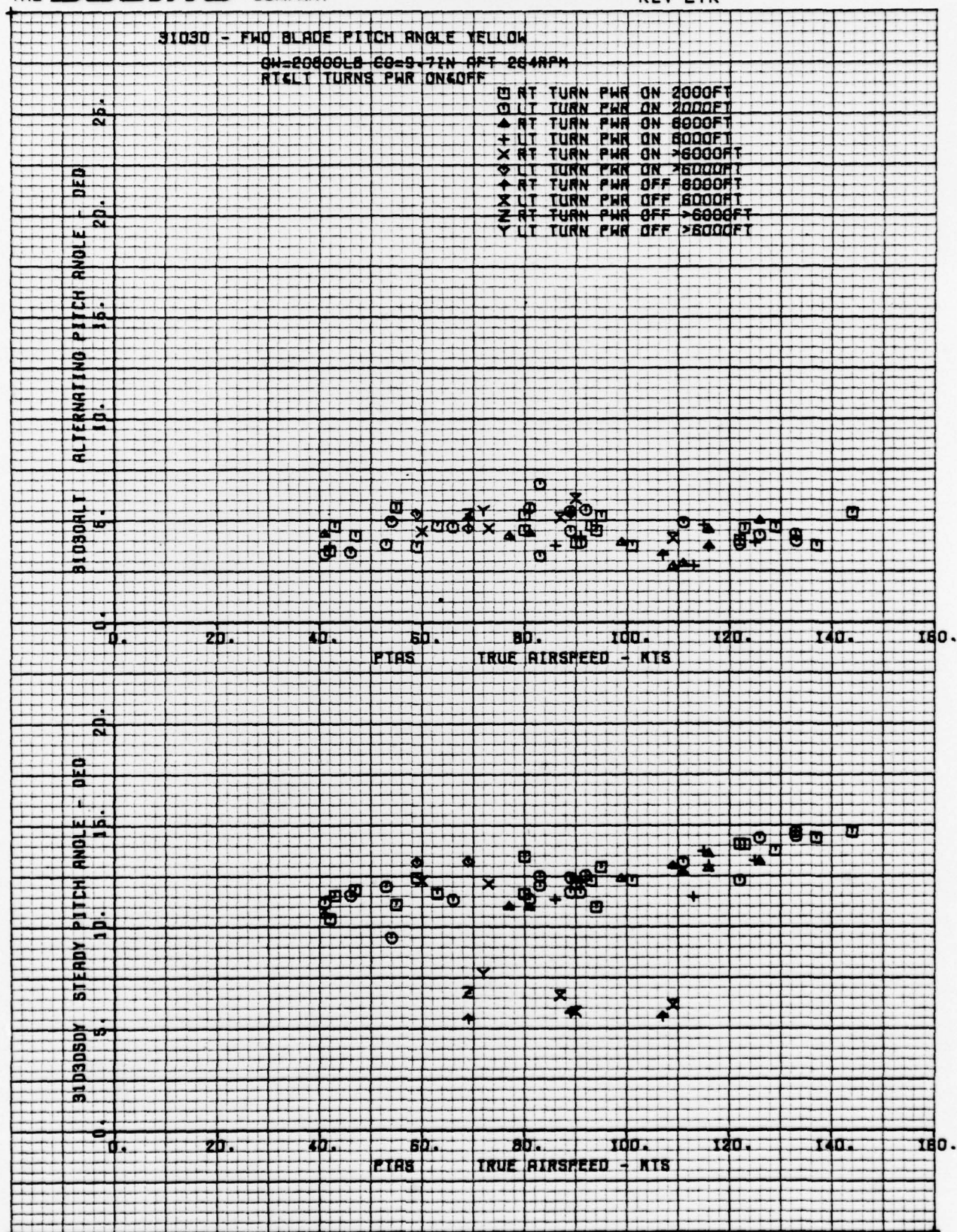
AD
A075570

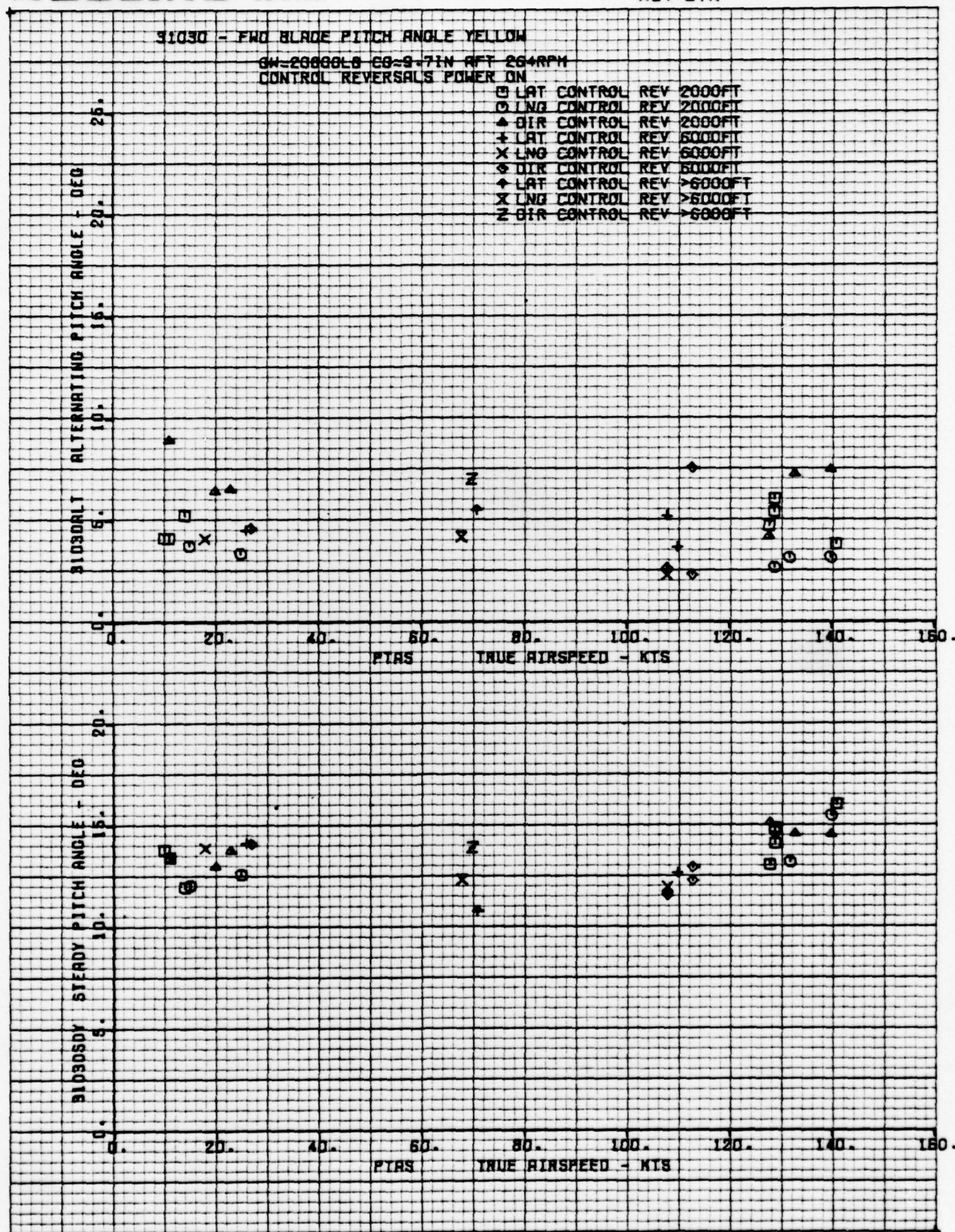


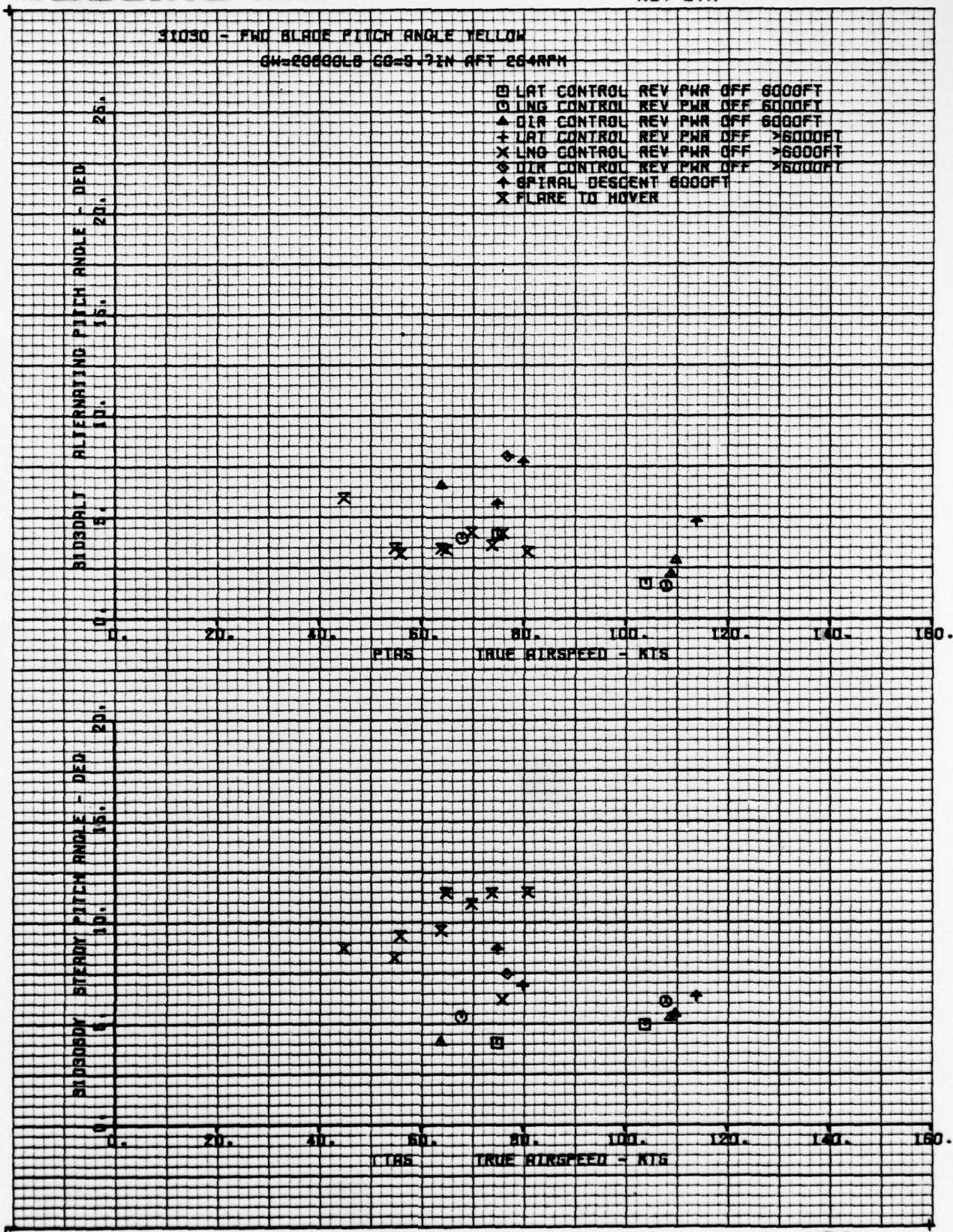


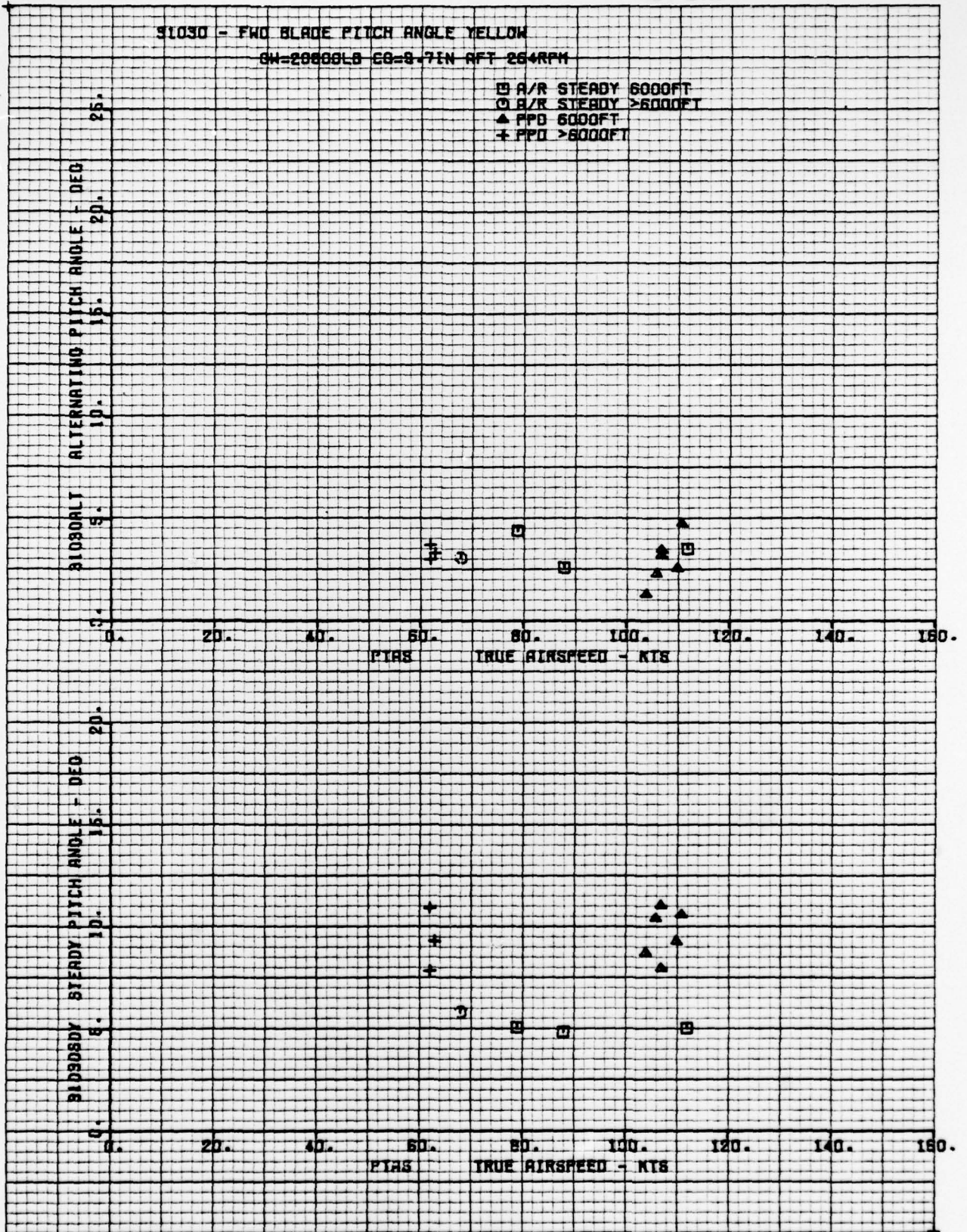
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A



THE **BOEING** COMPANY



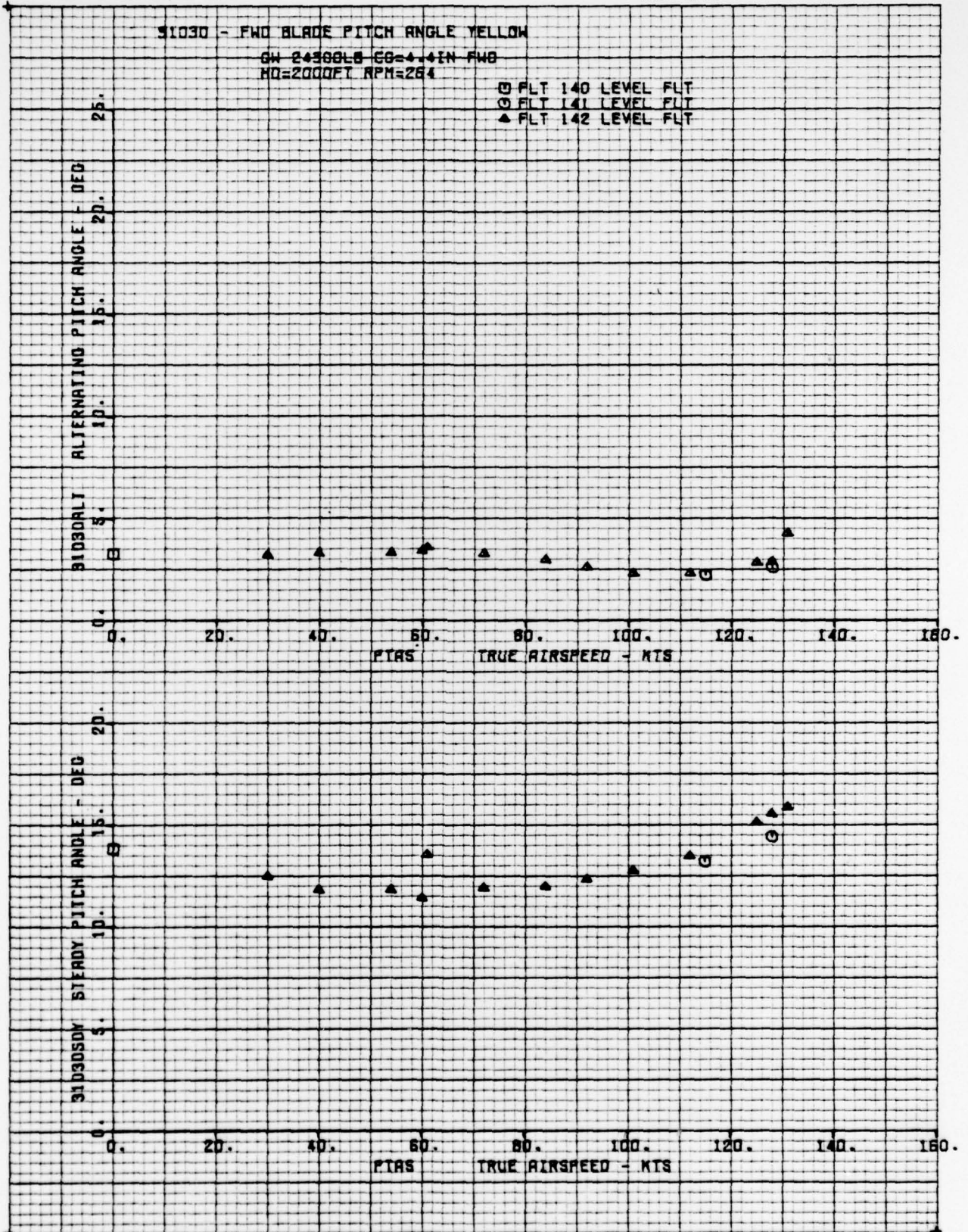


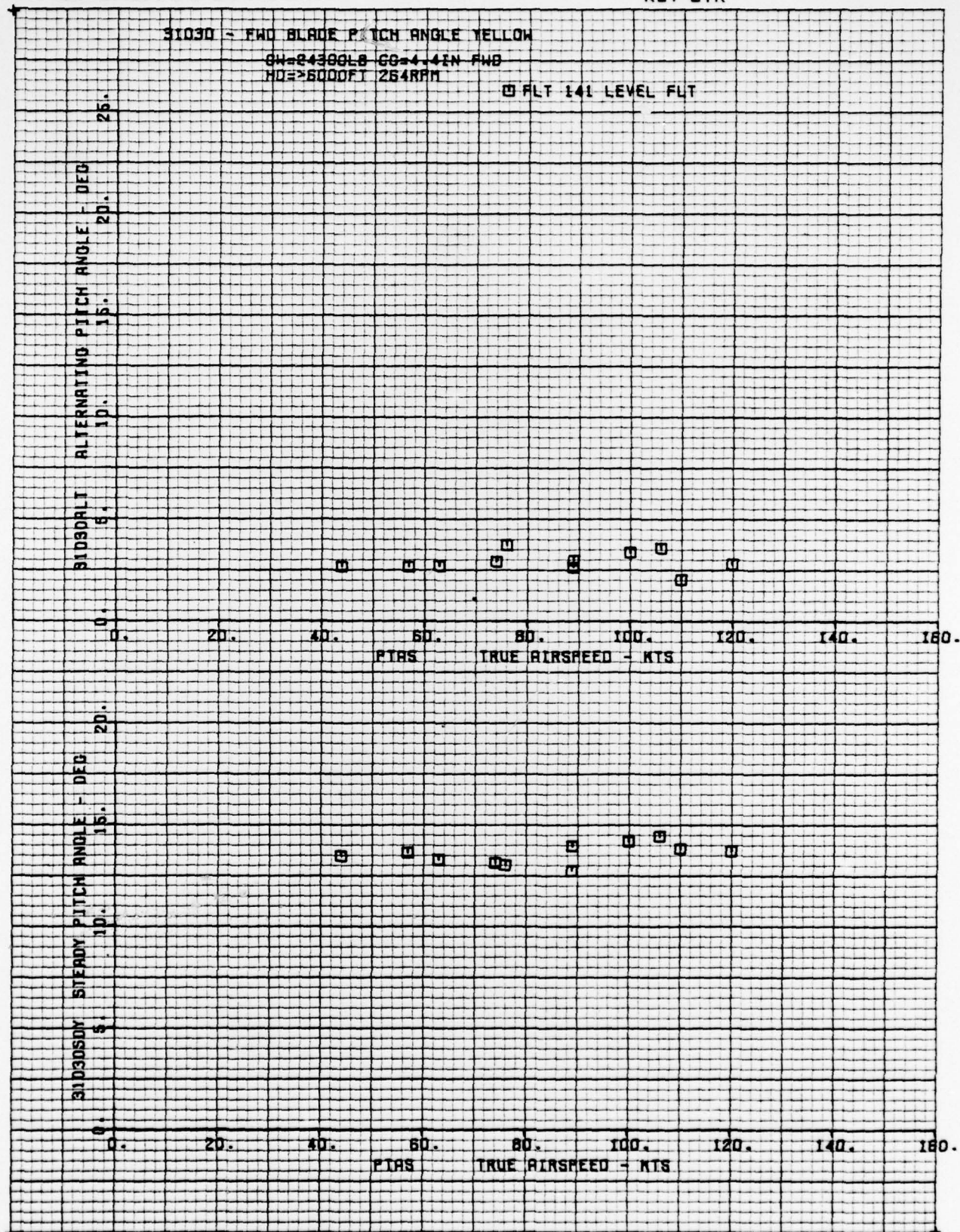


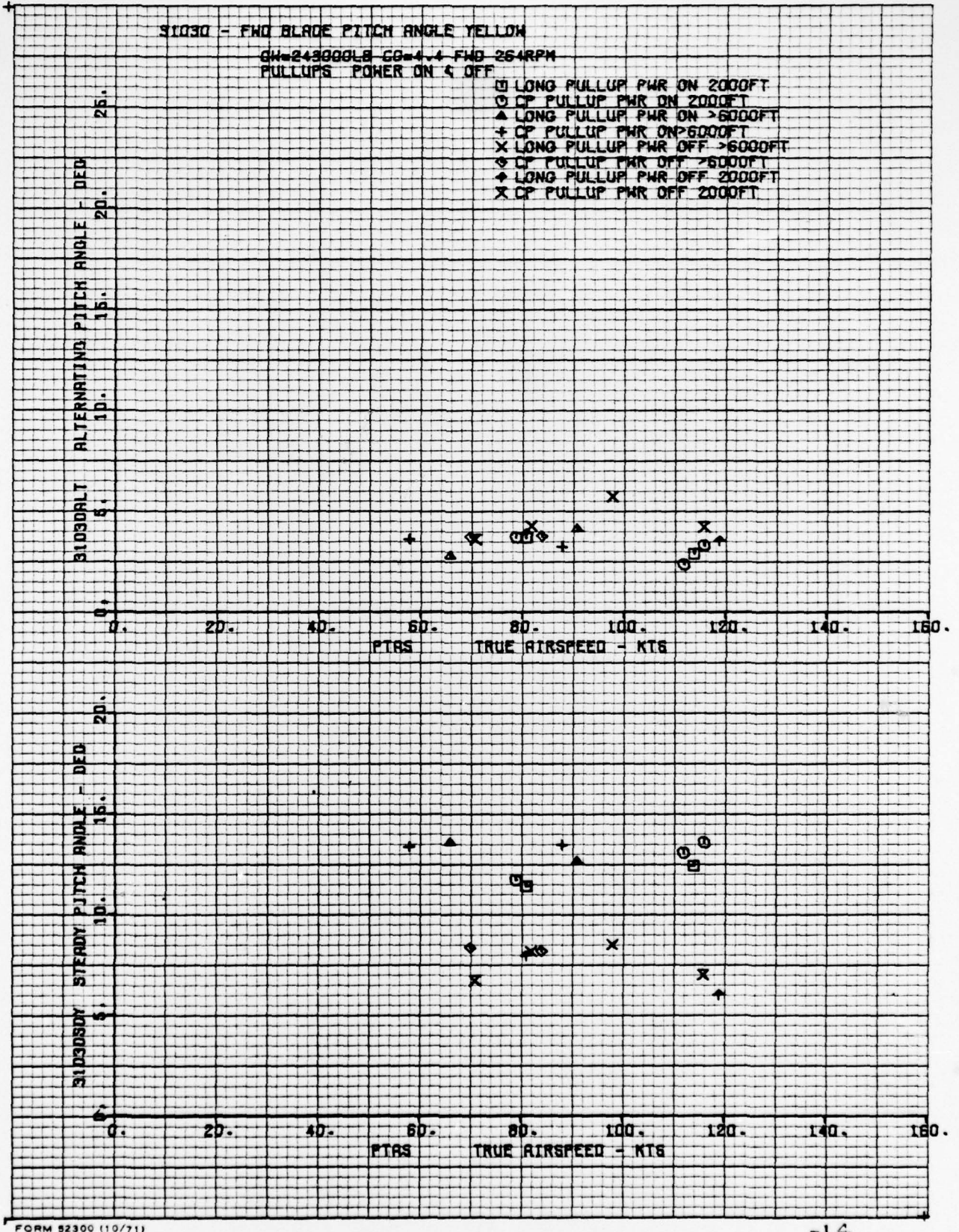
31030 - FWD BLADE PITCH ANGLE

GAGE INOPERATIVE

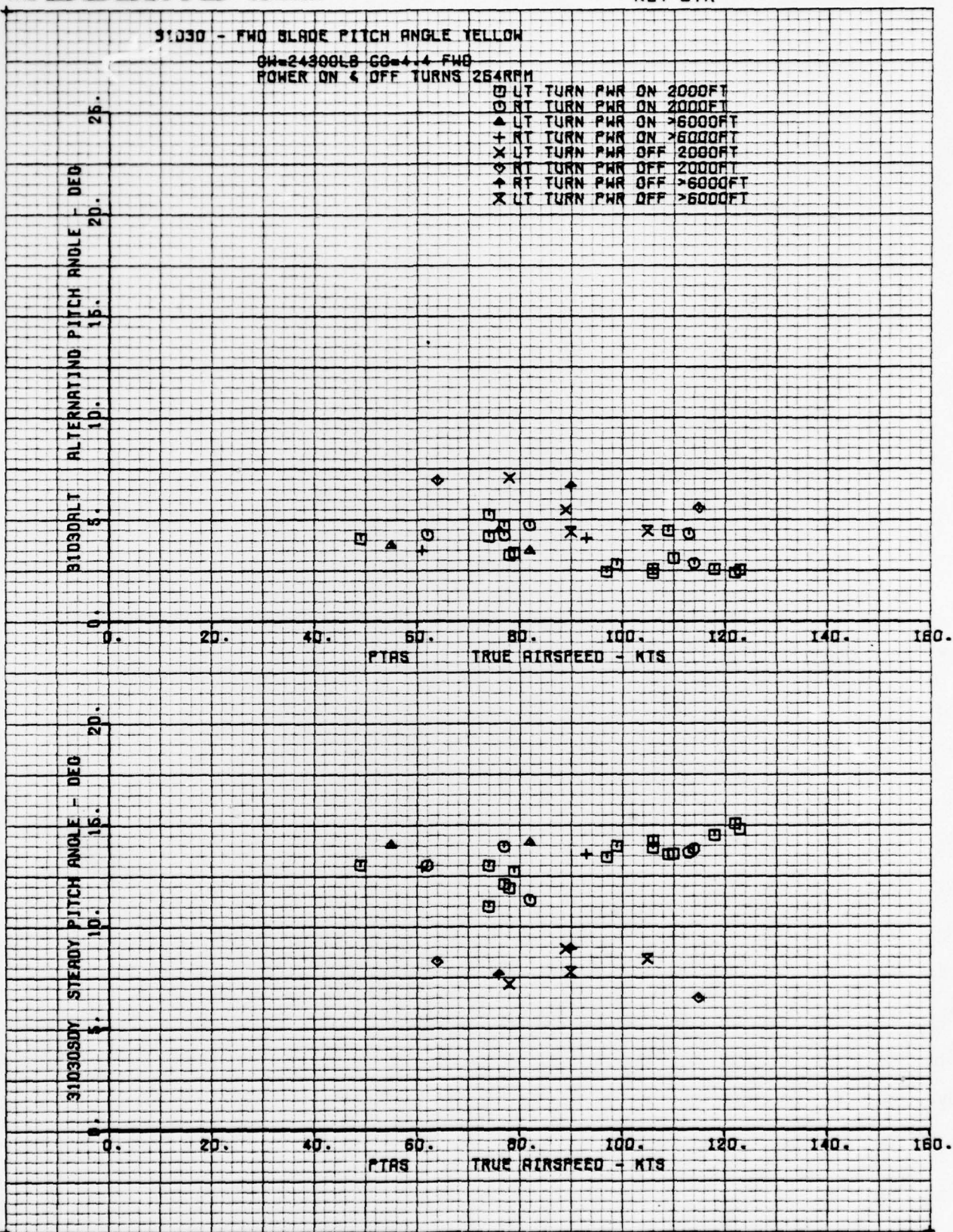
For Plot Numbers -6, -7, -13, -17, -21, -25, and -29.

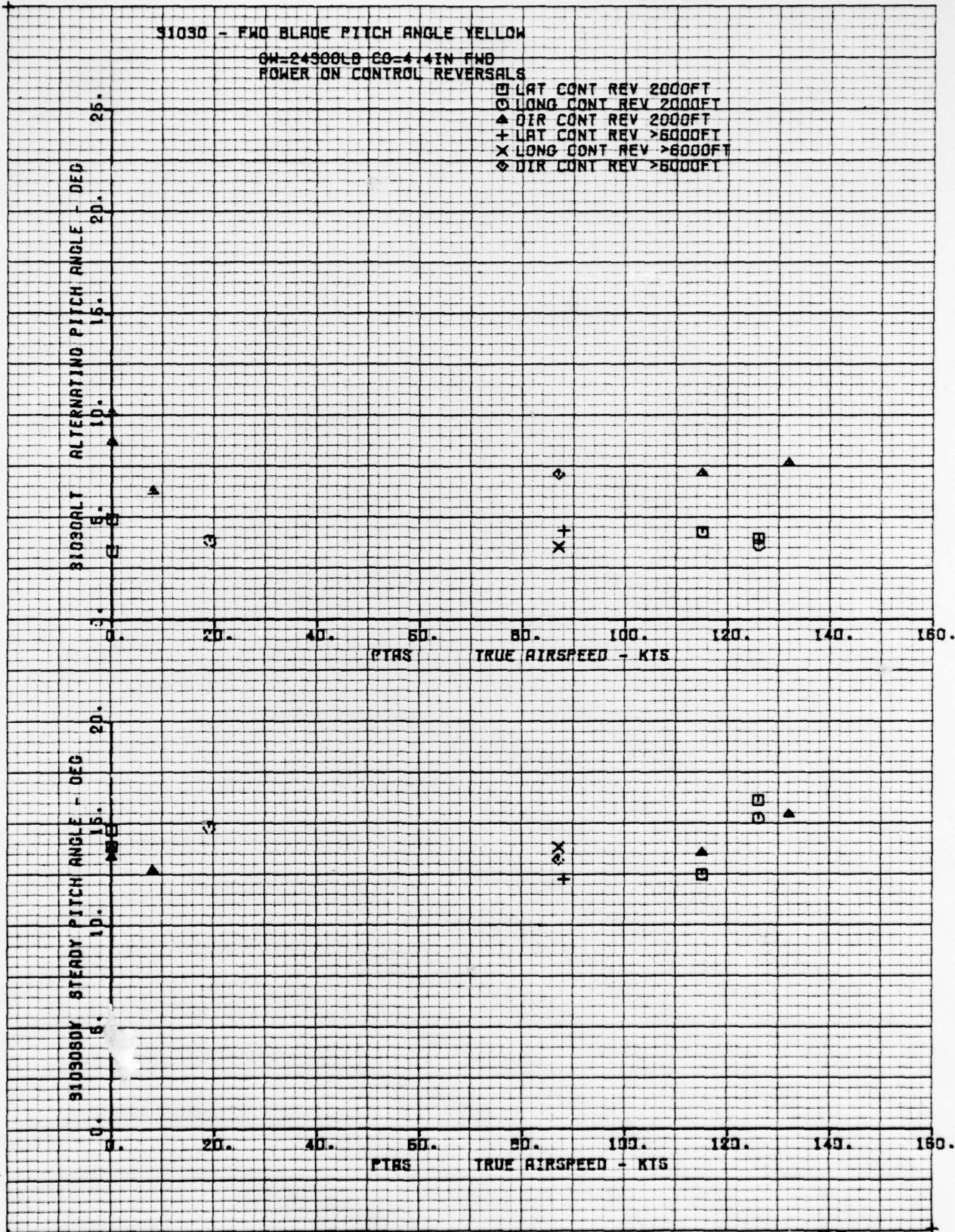




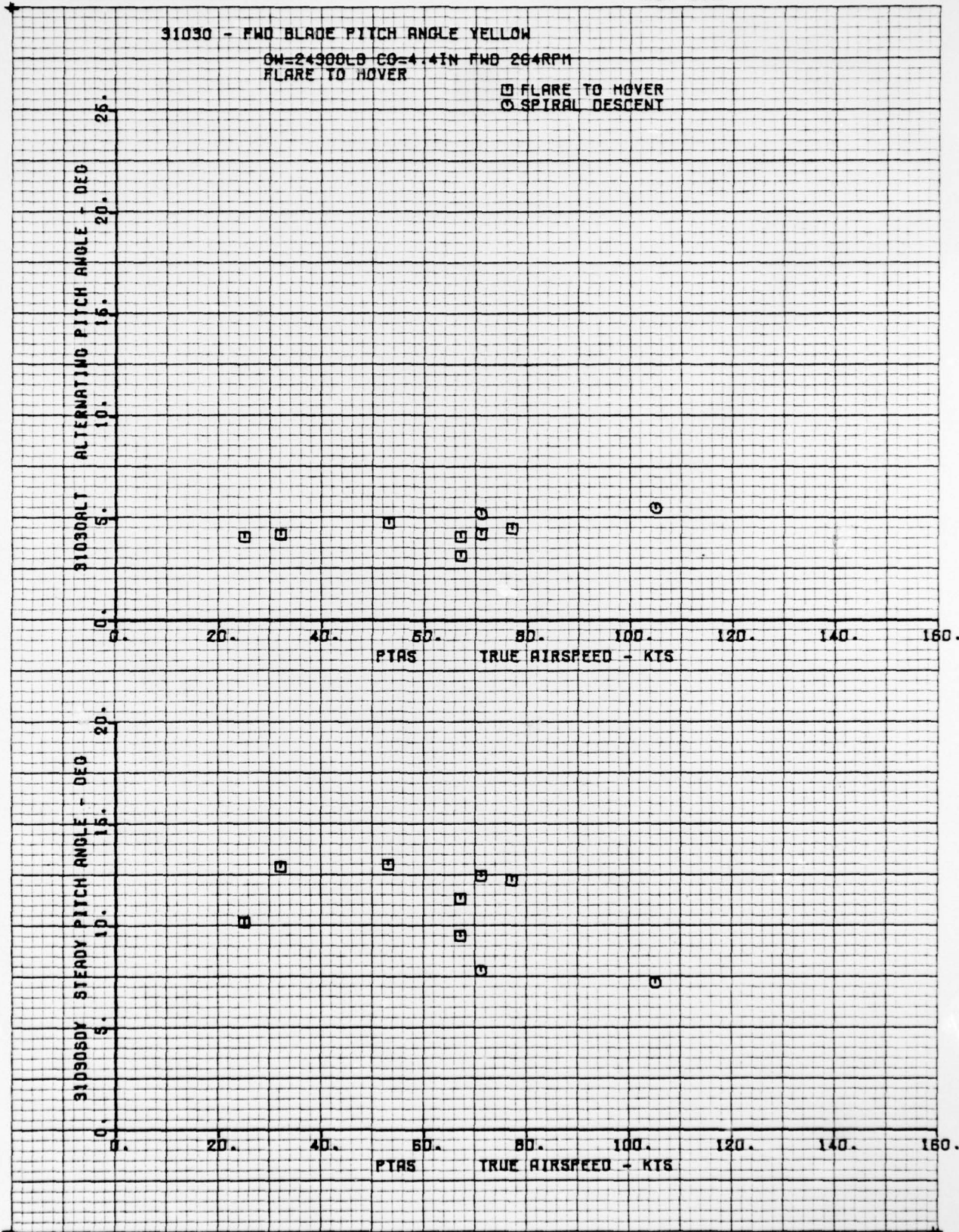
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FORM 52300 (10/71)

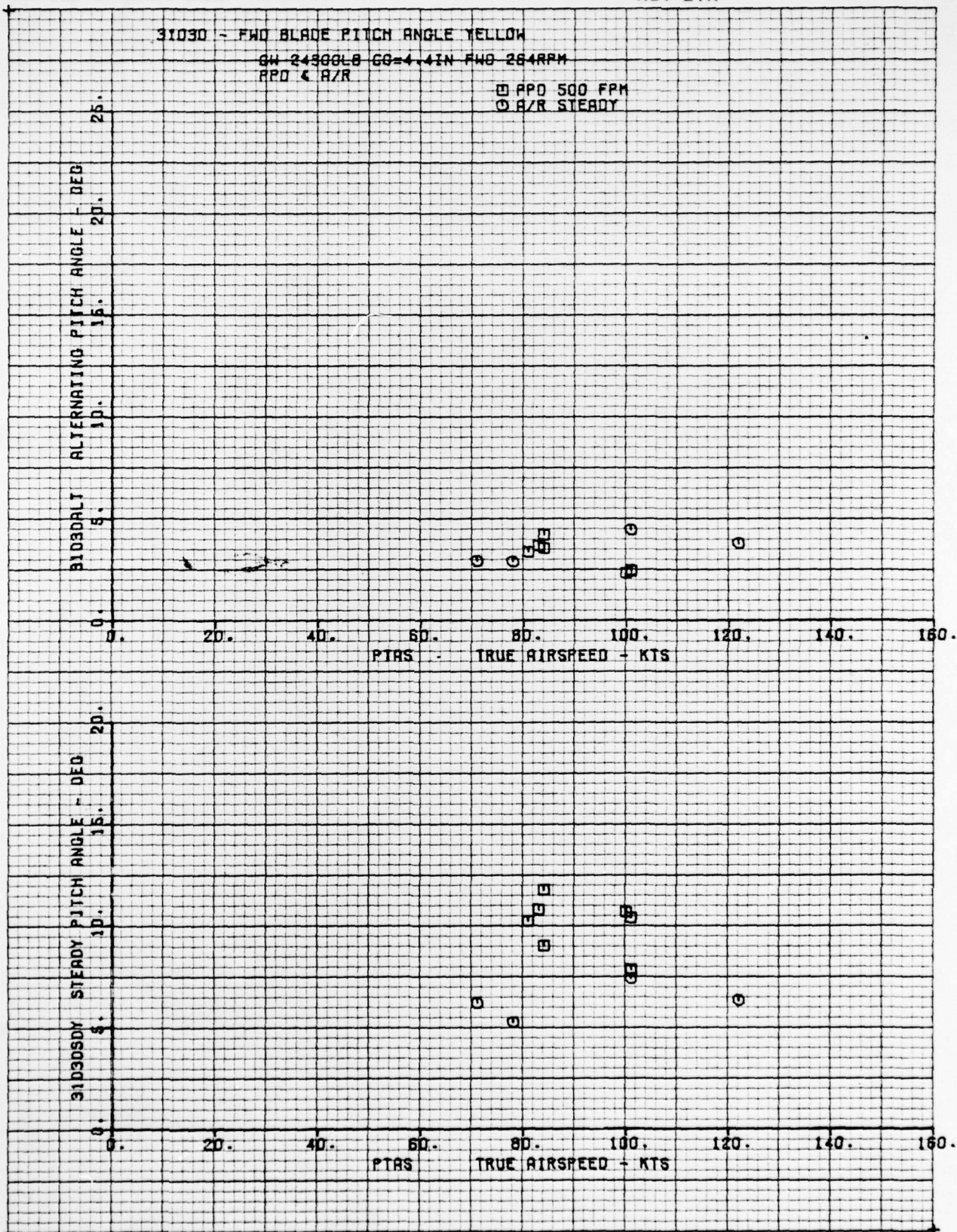


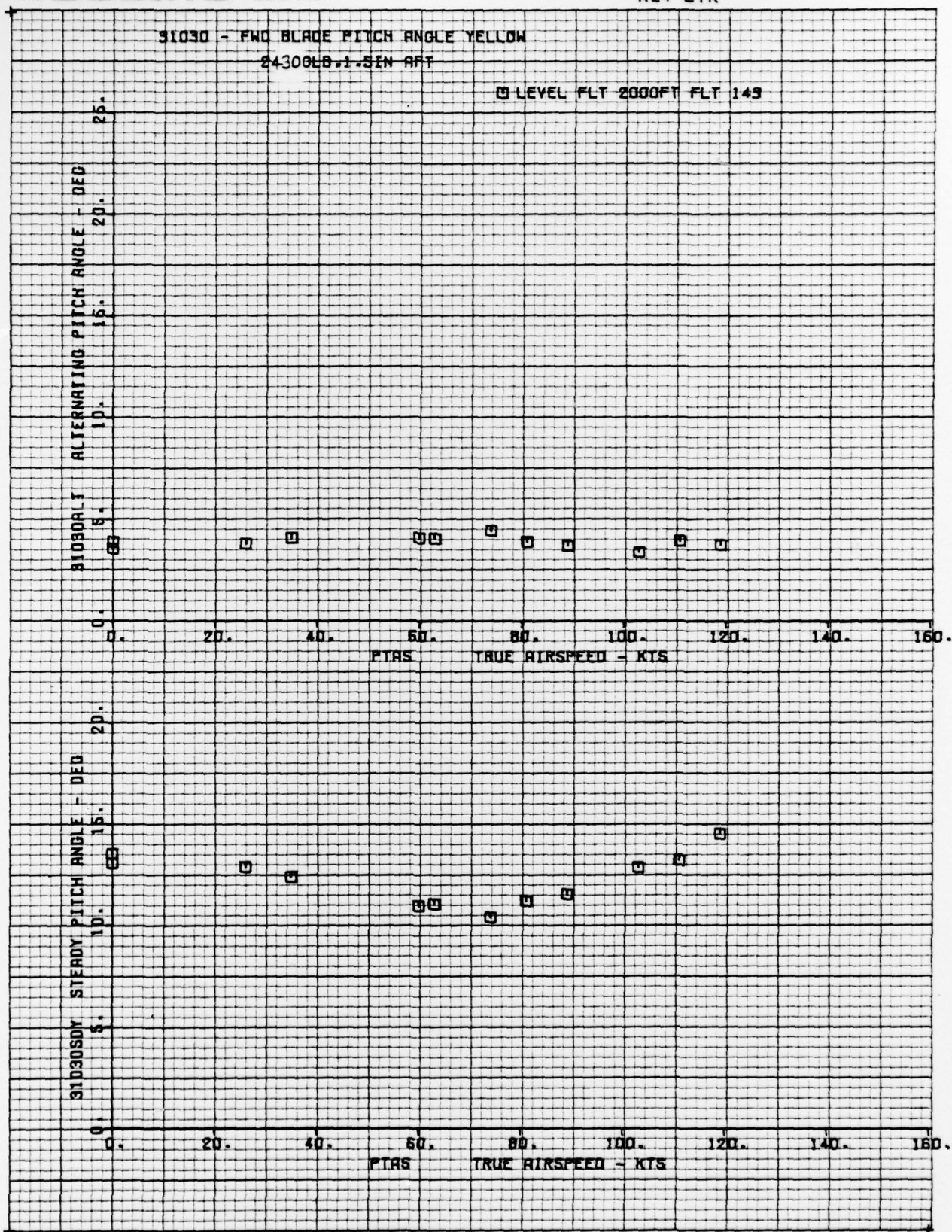


THE **BOEING** COMPANY



FORM 52300 (10/71)





THE **BOEING** COMPANY

PREPARED BY: J. Bendo

CHECKED BY:

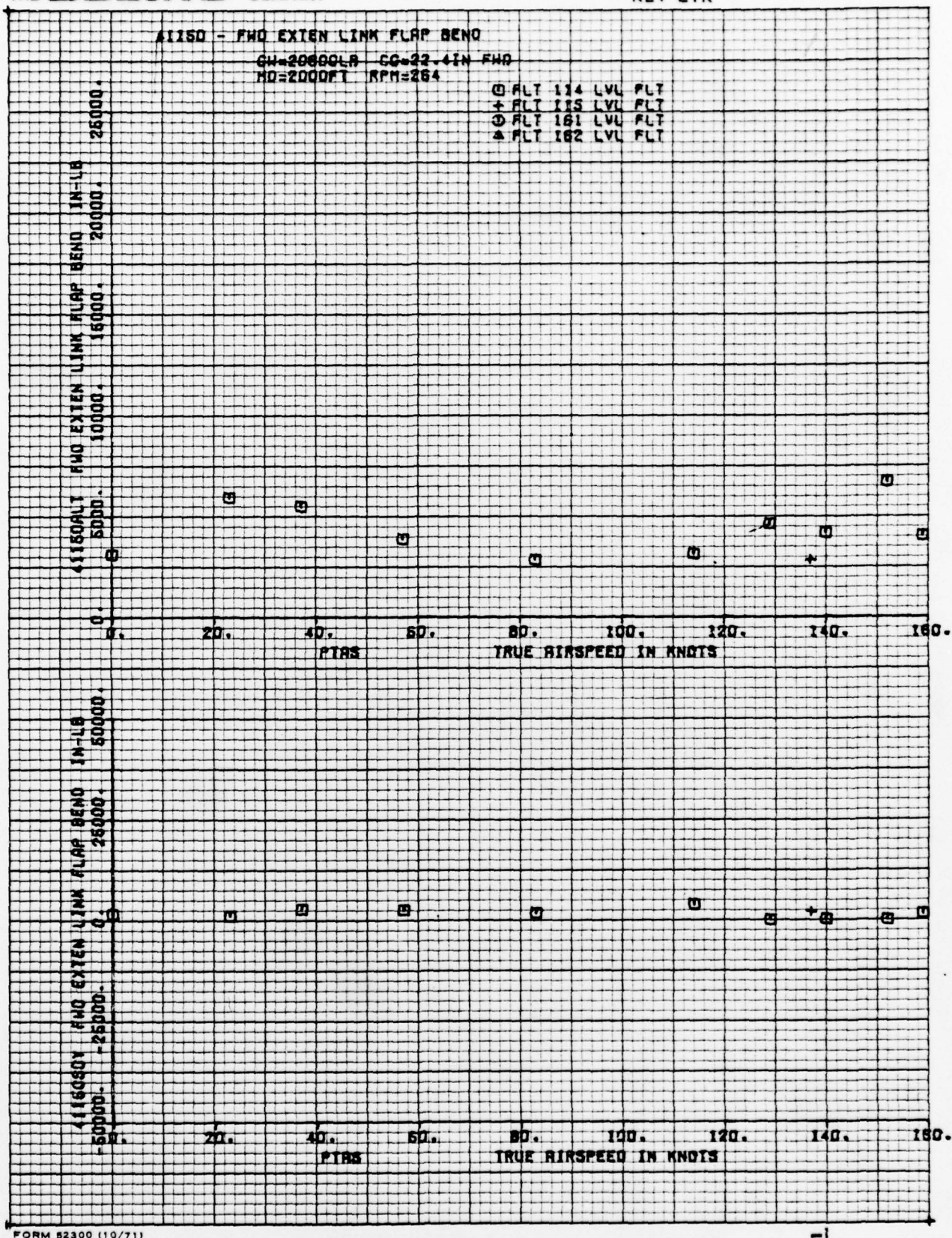
DATE: 8/28/78

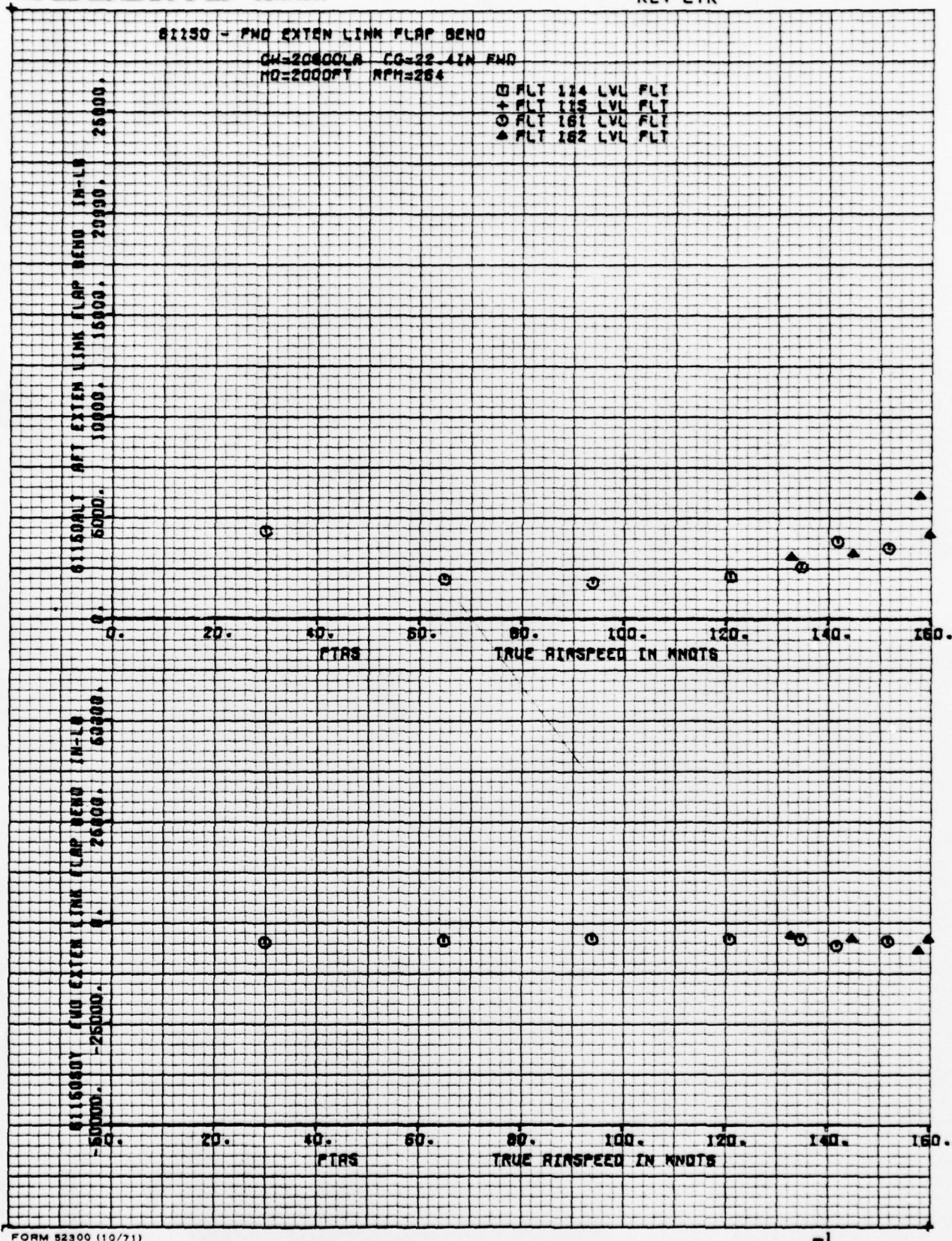
NUMBER D210-11168-3

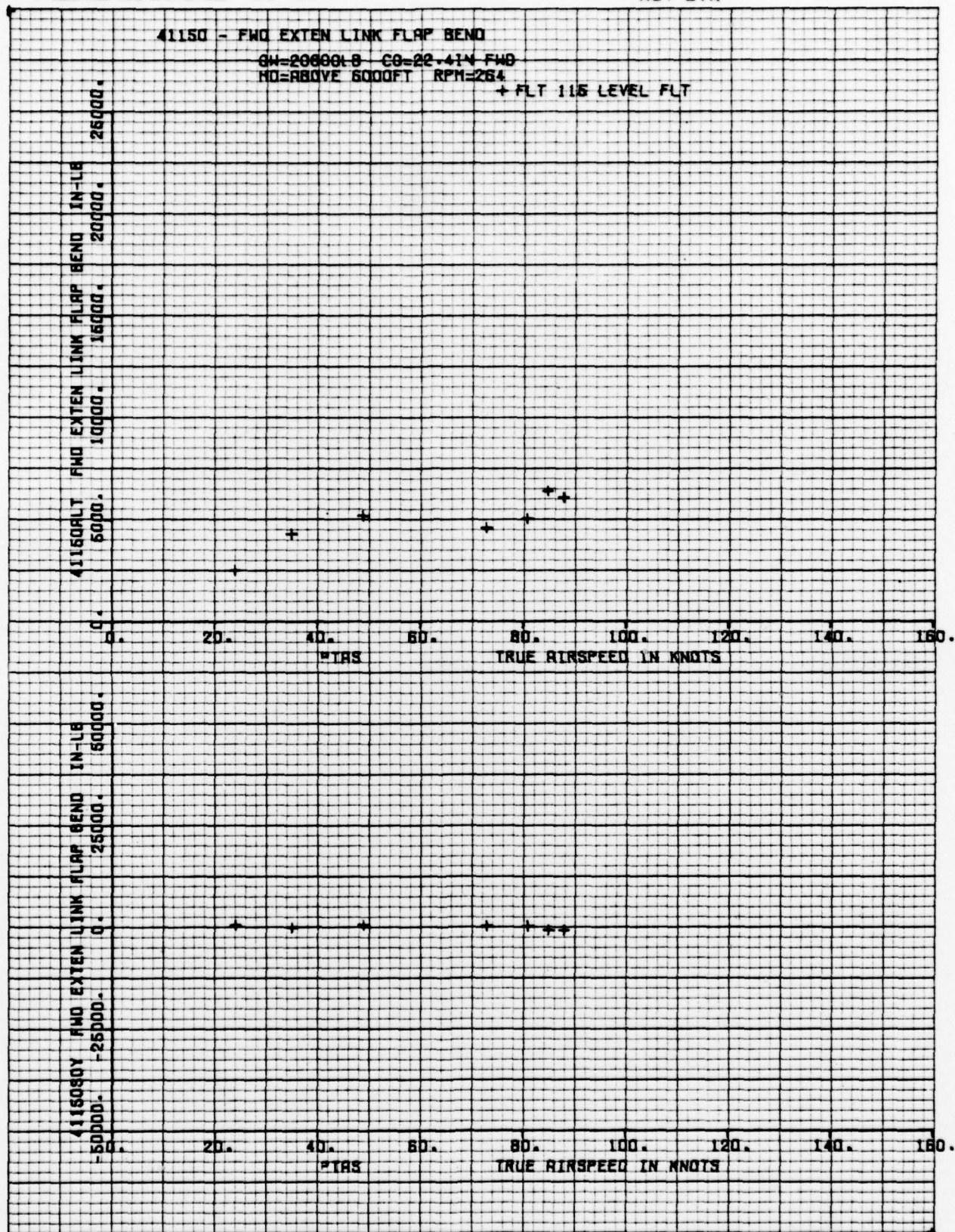
REV LTR Volume 2

MODEL NO.

4.4 Forward Blade Extension Link Flap Bending



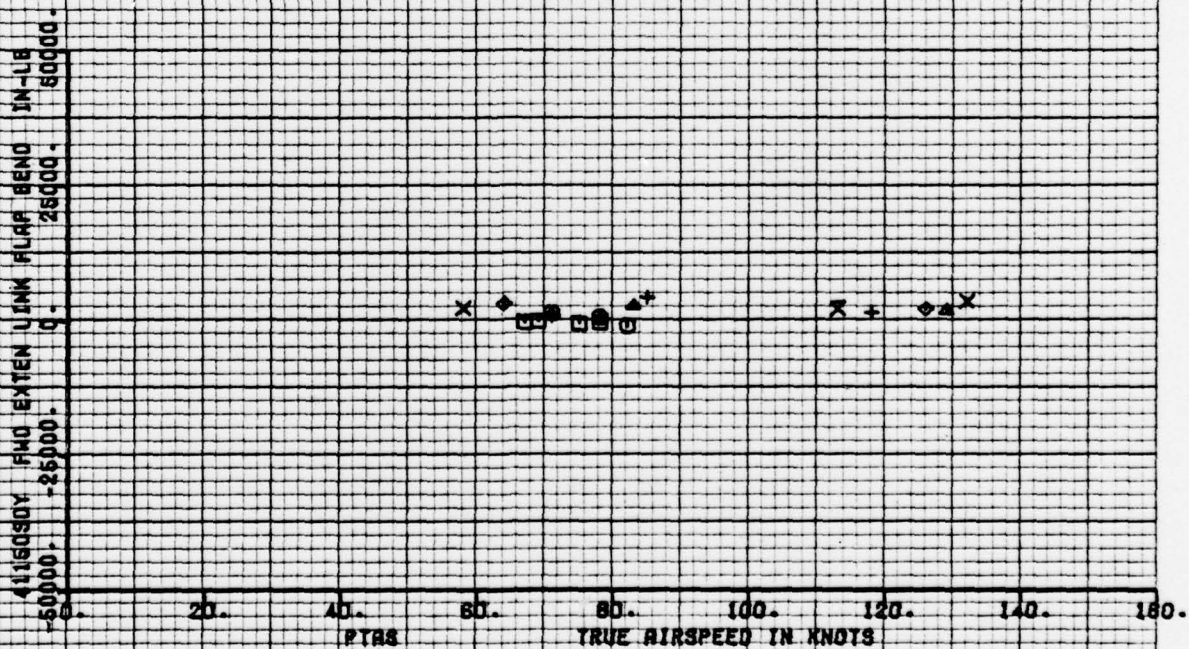
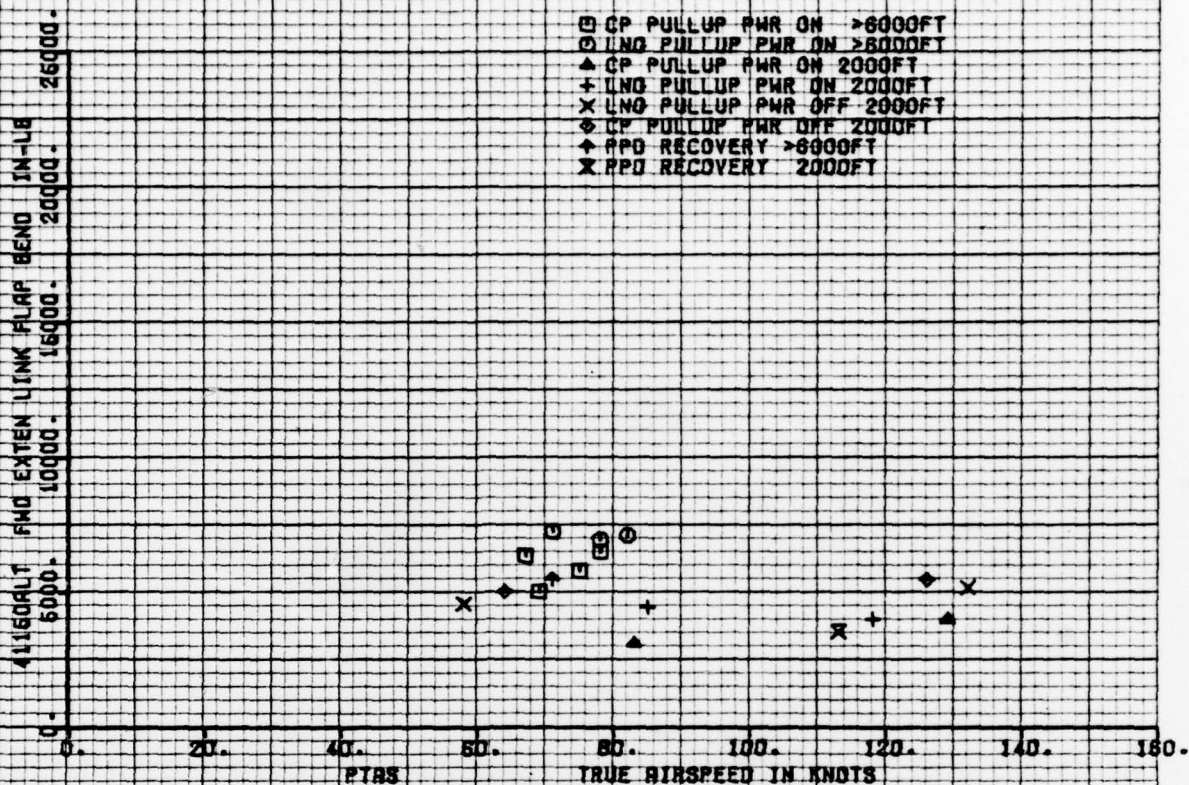


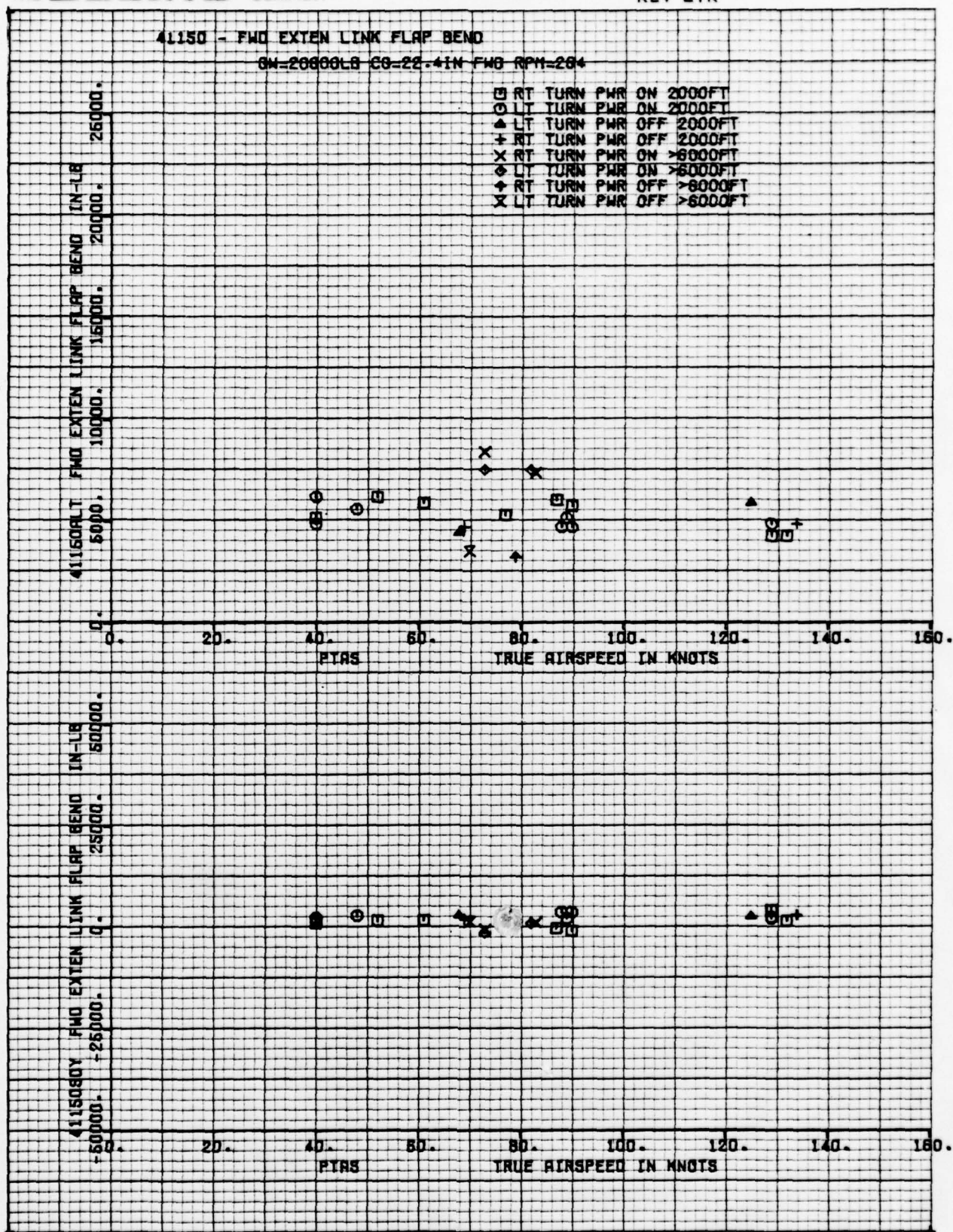


41150 - FWD EXTEN LINK FLAP BEND

OW-20000LB CO-22.4IN FWD RPM-204

- CP PULLUP PWR ON >6000FT
- LNO PULLUP PWR ON >6000FT
- △ CP PULLUP PWR ON 2000FT
- + LNO PULLUP PWR ON 2000FT
- x LNO PULLUP PWR OFF 2000FT
- ◇ CP PULLUP PWR OFF 2000FT
- ↑ RPO RECOVERY >6000FT
- x RPO RECOVERY 2000FT



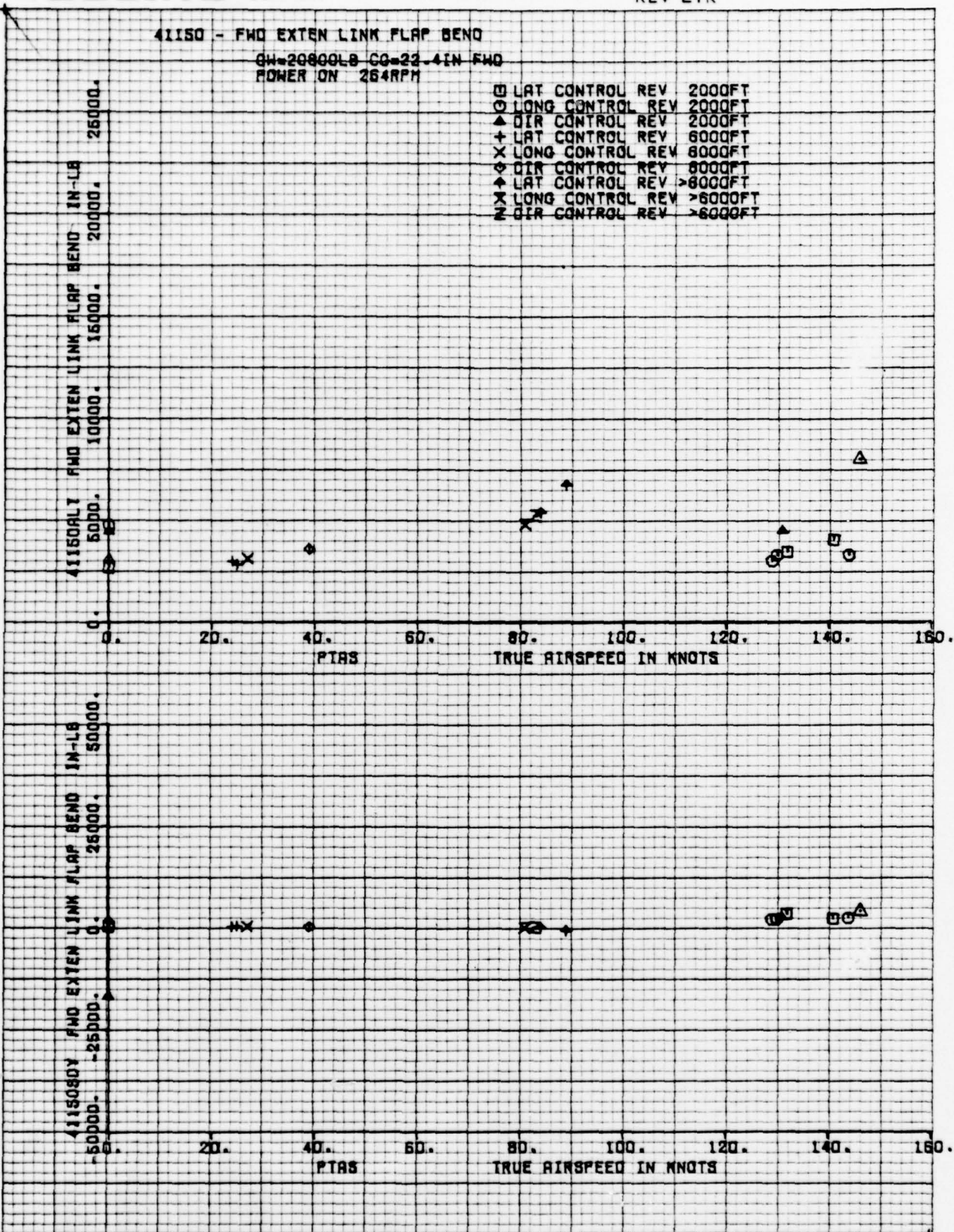


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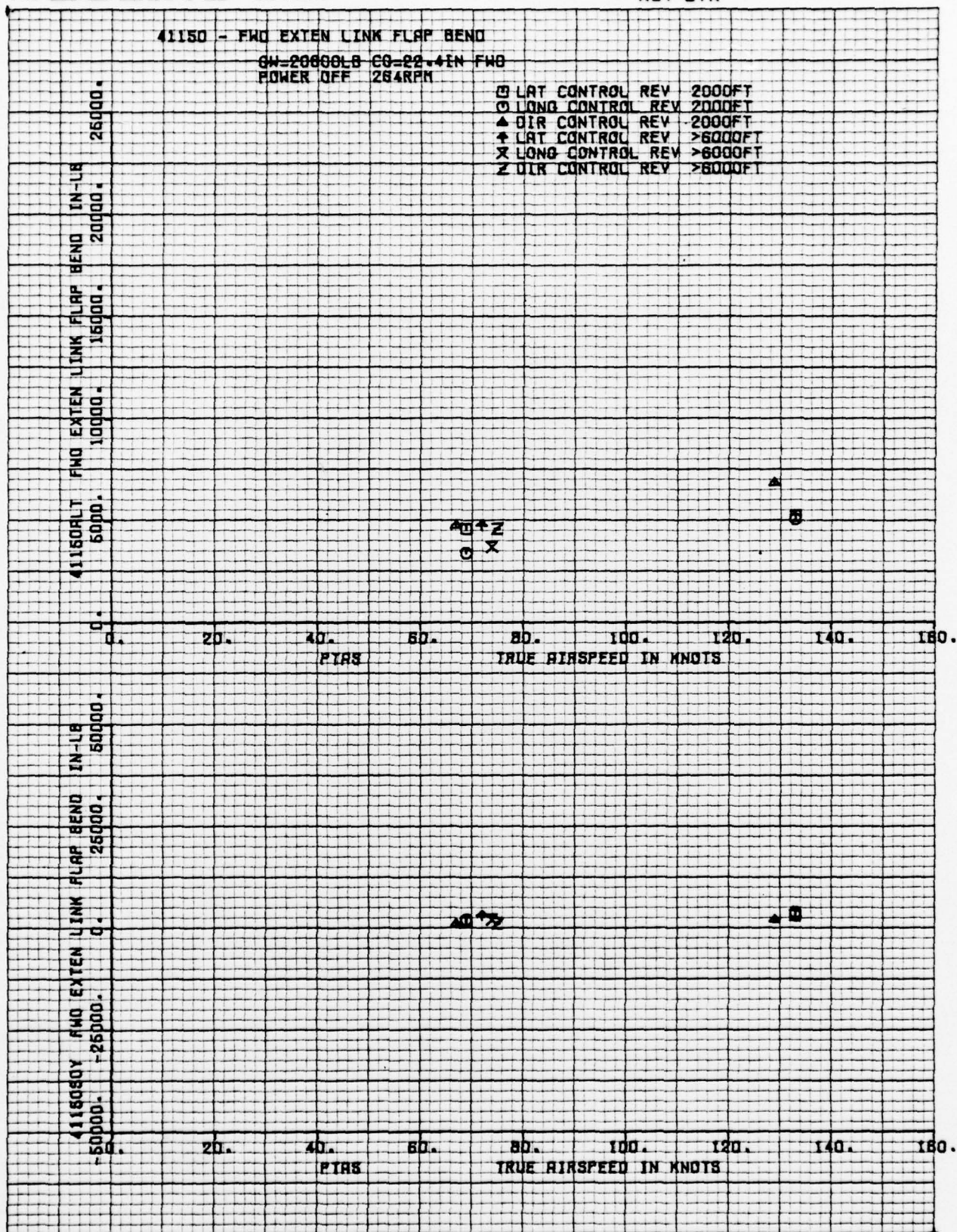
41150 - FWD EXTEN LINK FLAP BEND

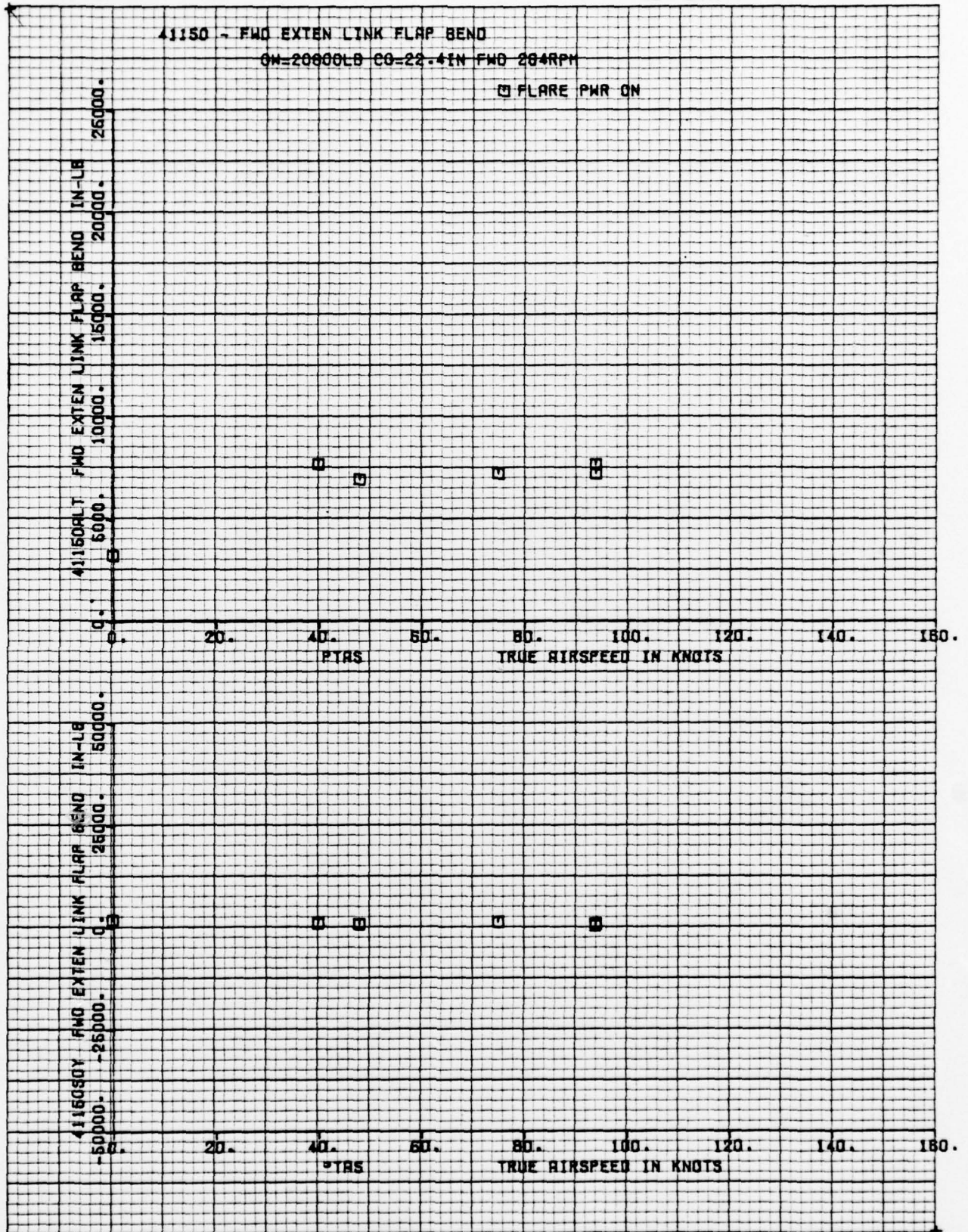
GW=20800LB CG=22.4IN FWD
POWER ON 264RPM

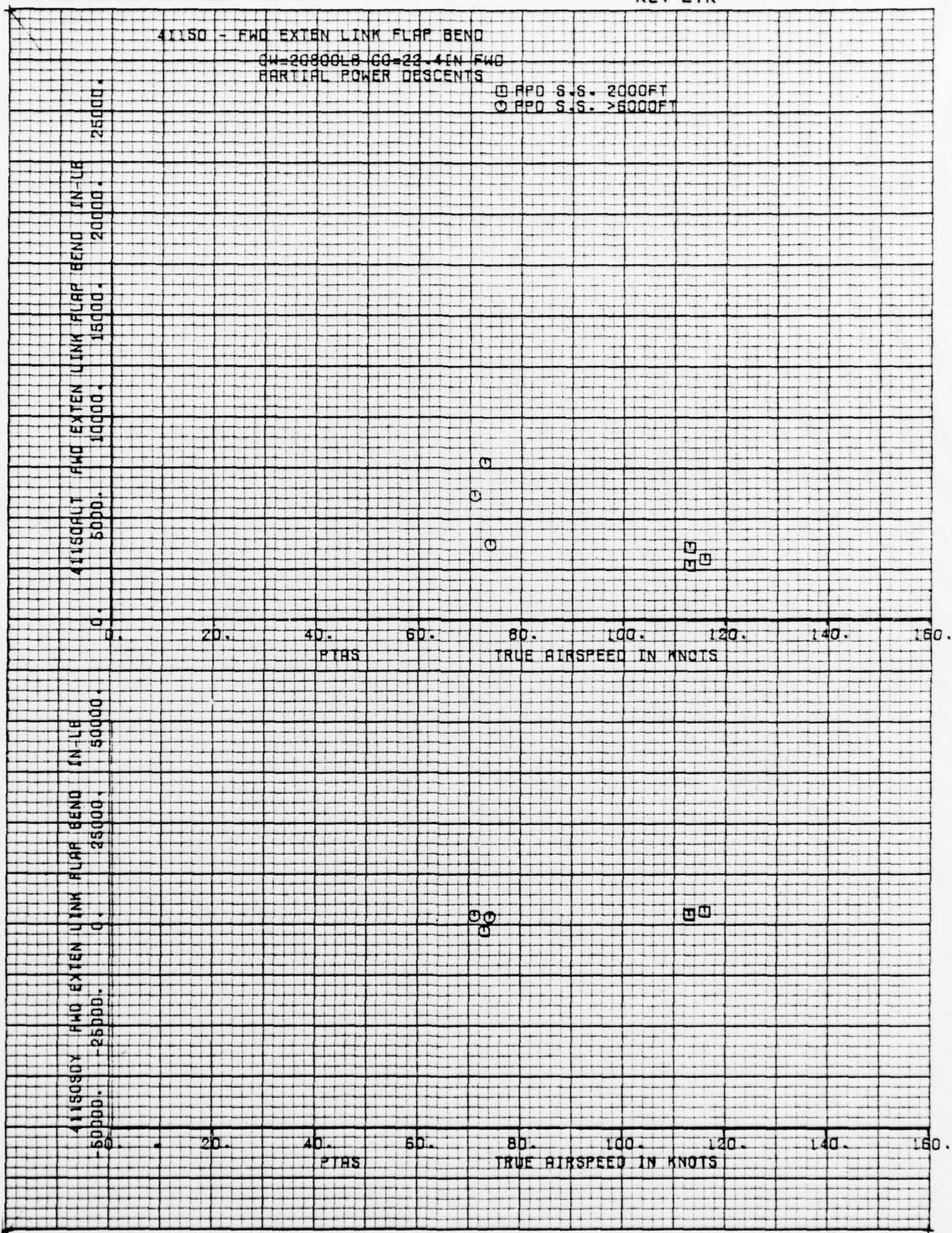
□ LAT CONTROL REV 2000FT
 ○ LONG CONTROL REV 2000FT
 ▲ DIR CONTROL REV 2000FT
 + LAT CONTROL REV 8000FT
 × LONG CONTROL REV 8000FT
 ◇ DIR CONTROL REV 8000FT
 ◆ LAT CONTROL REV >8000FT
 X LONG CONTROL REV >8000FT
 Z DIR CONTROL REV >8000FT

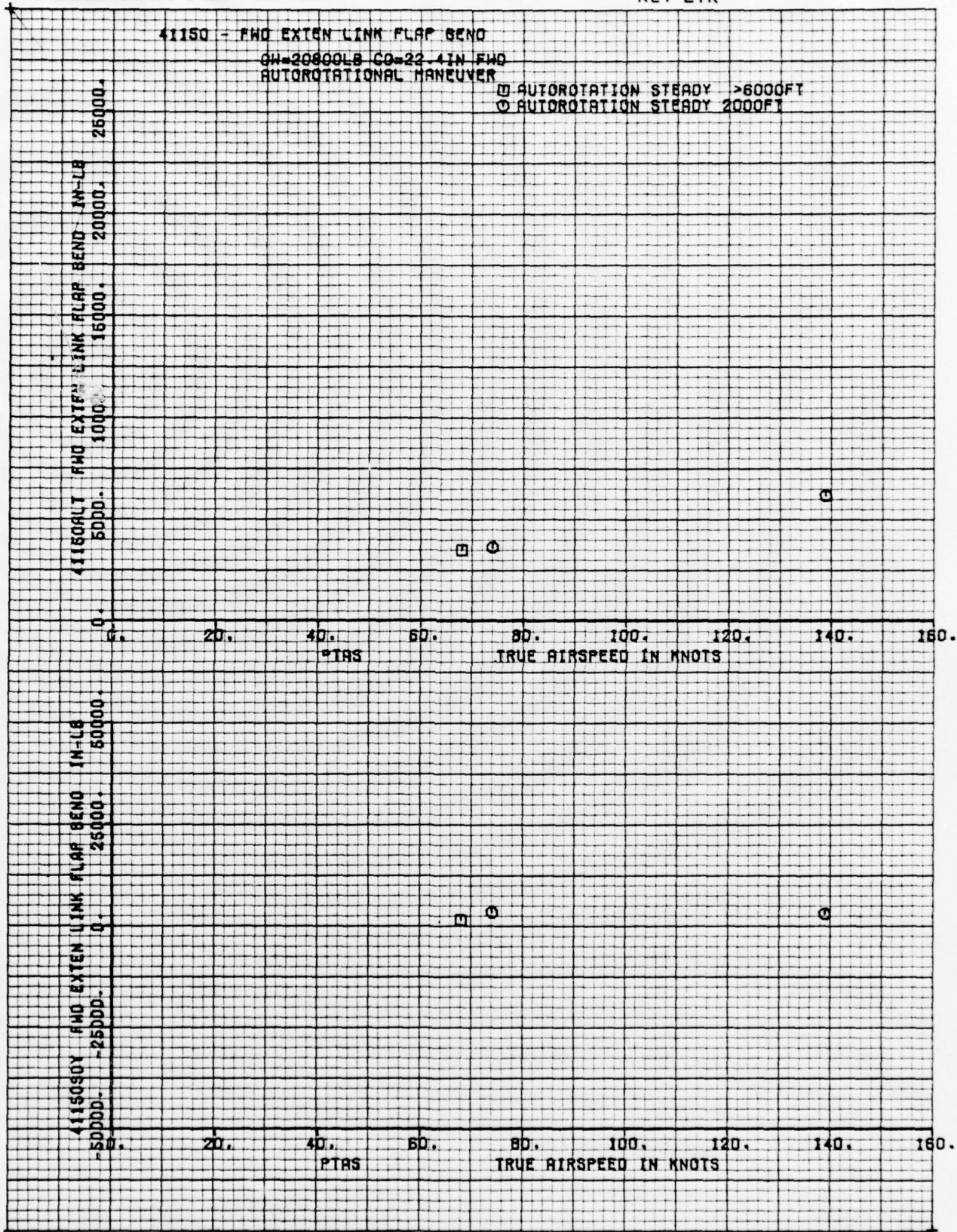


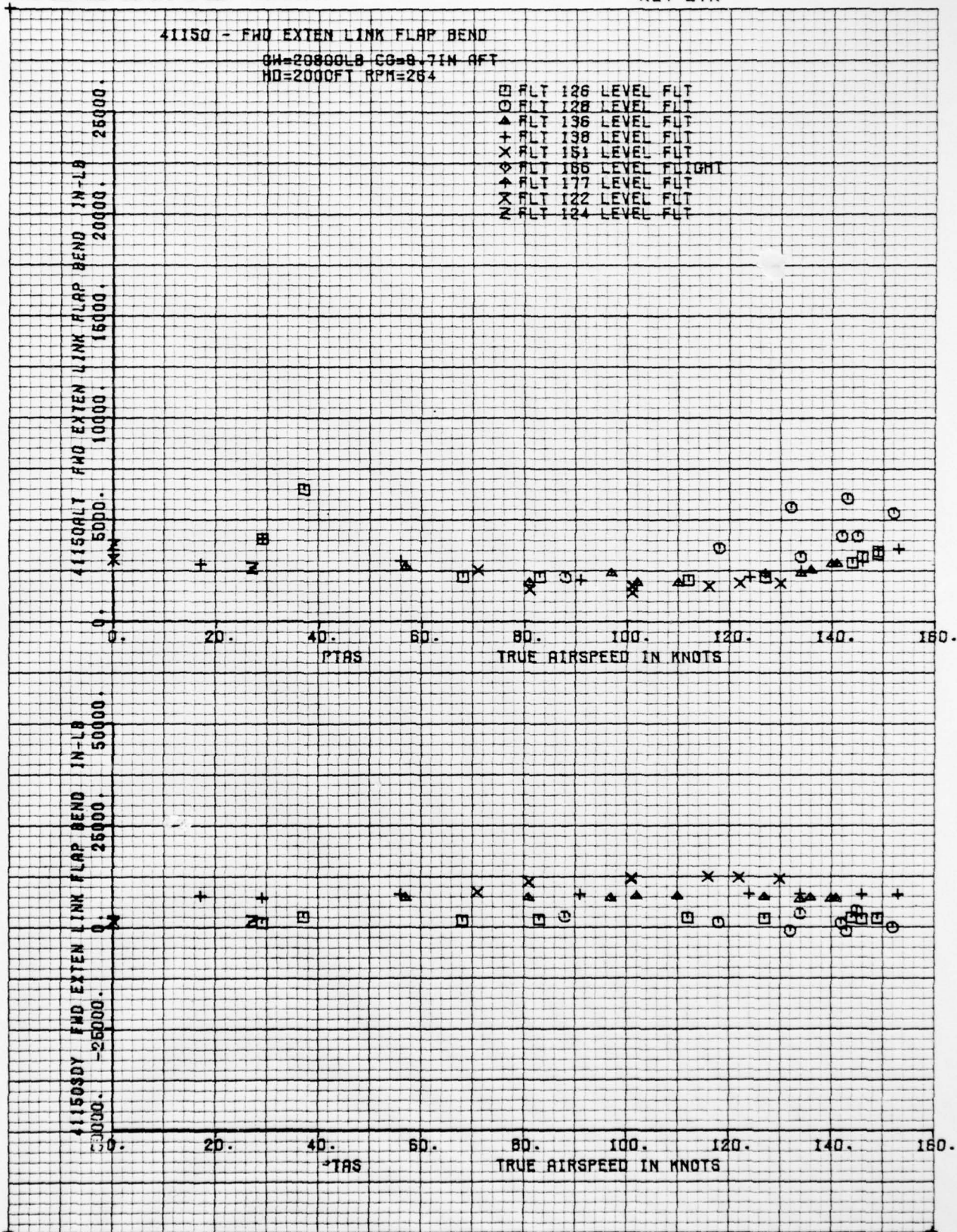
FORM 52300 (10/71)

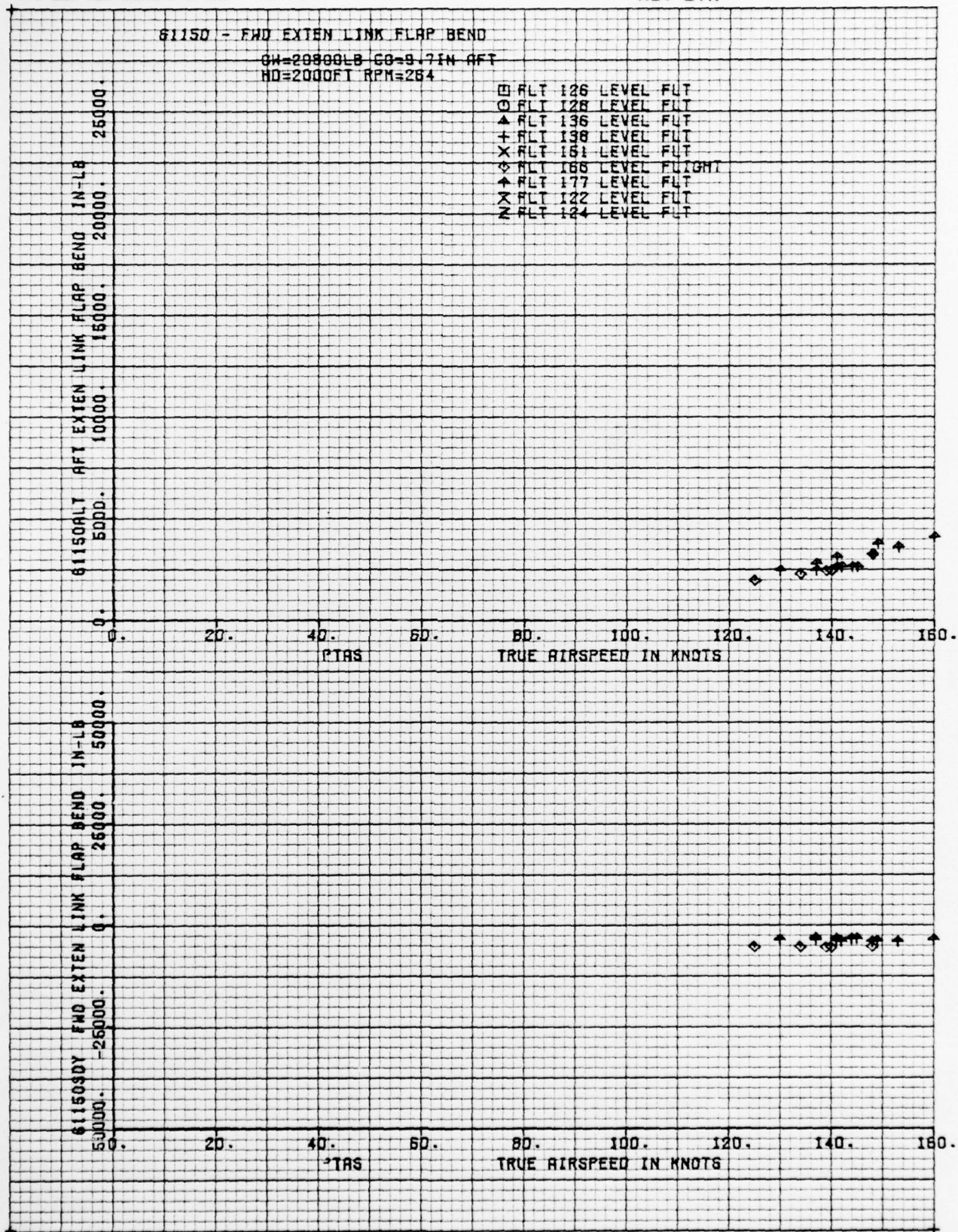




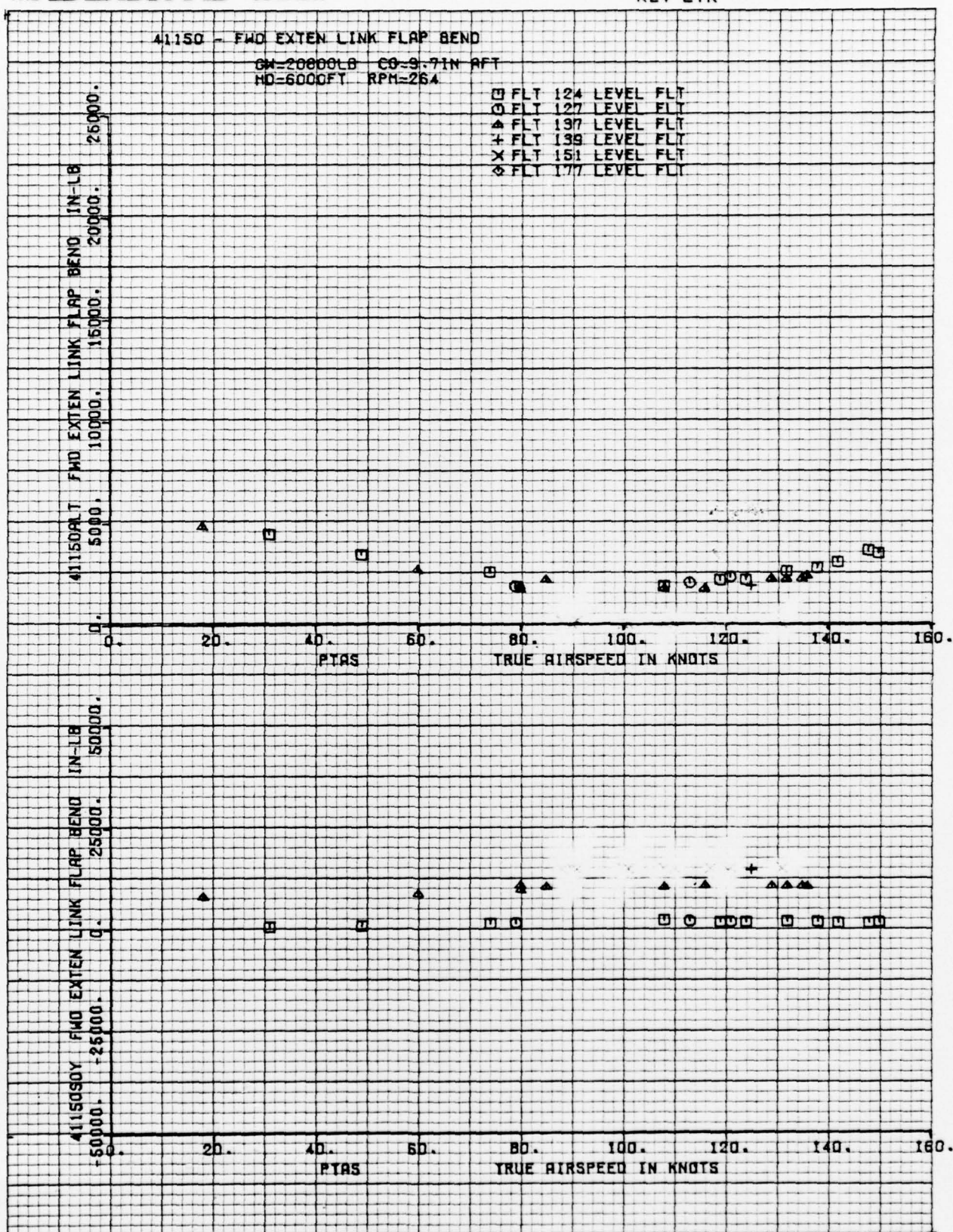


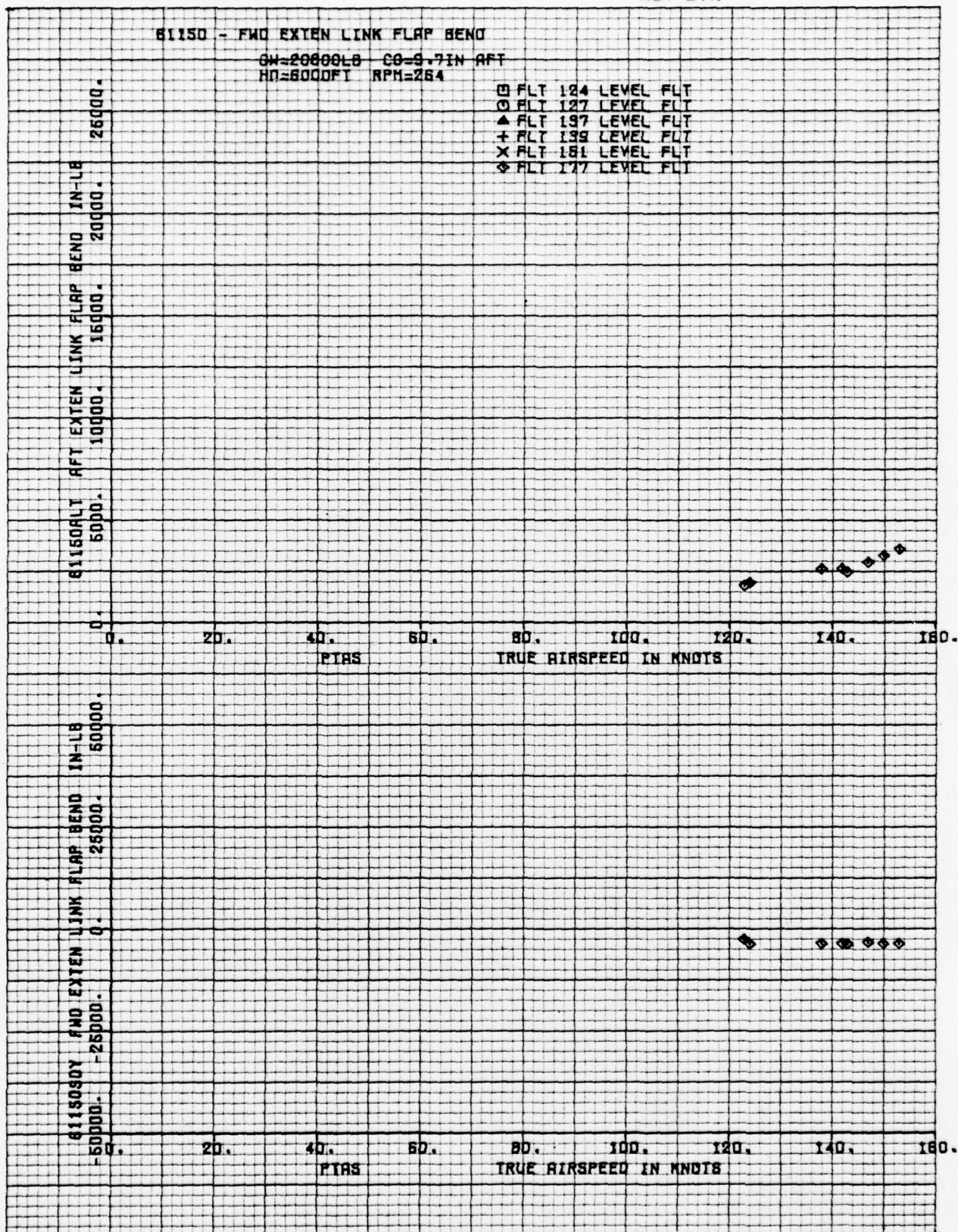


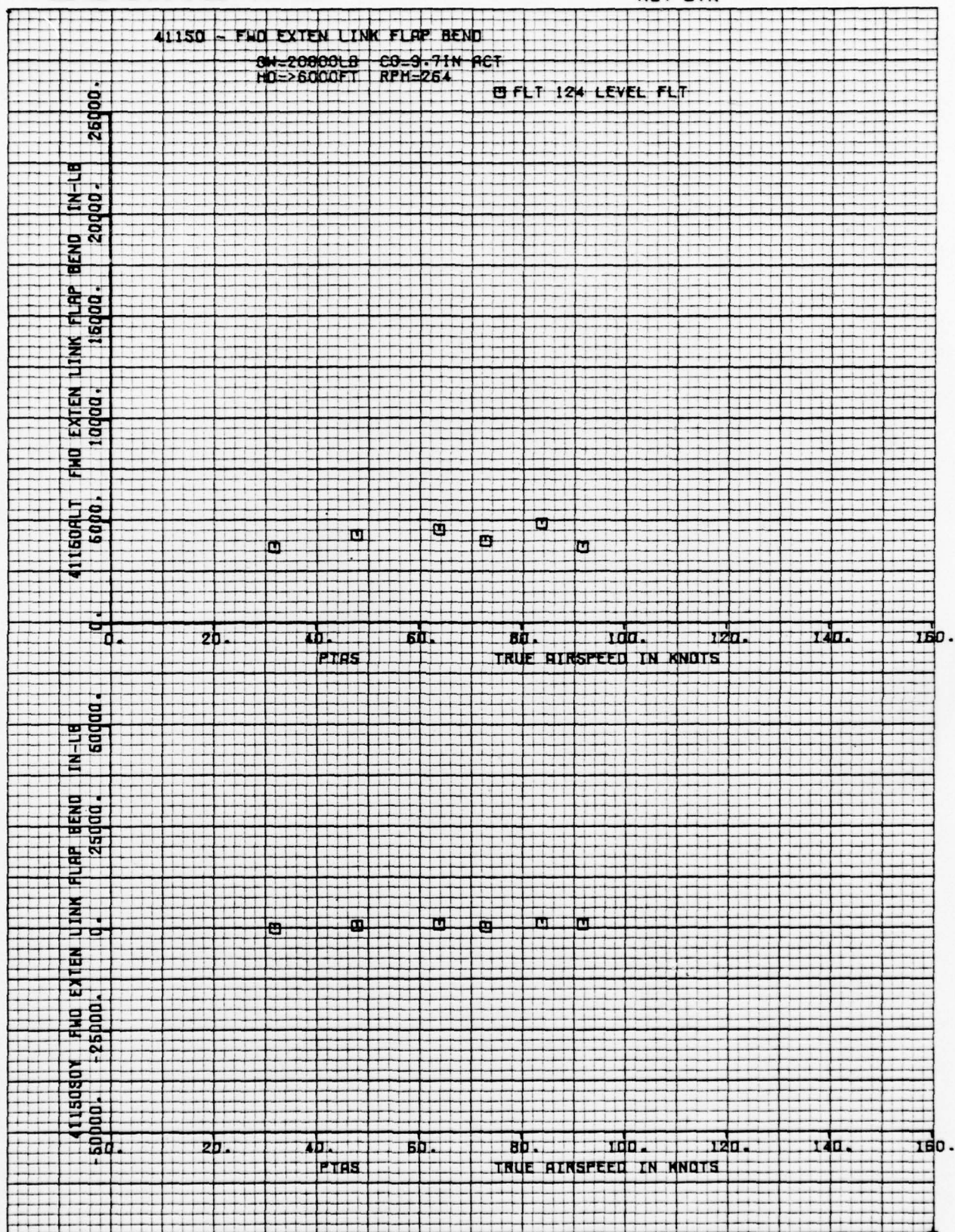


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FORM 52300 (10/71)

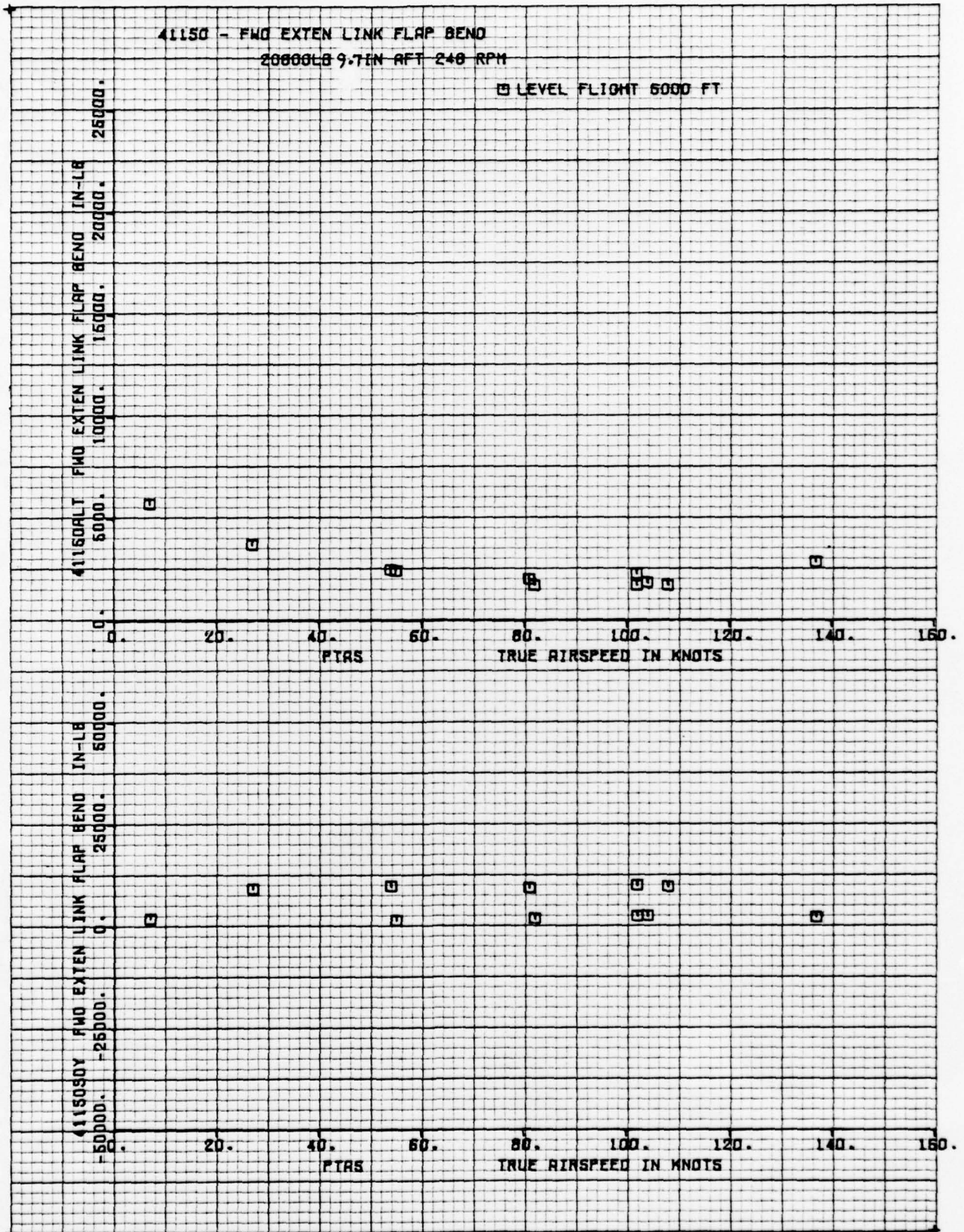




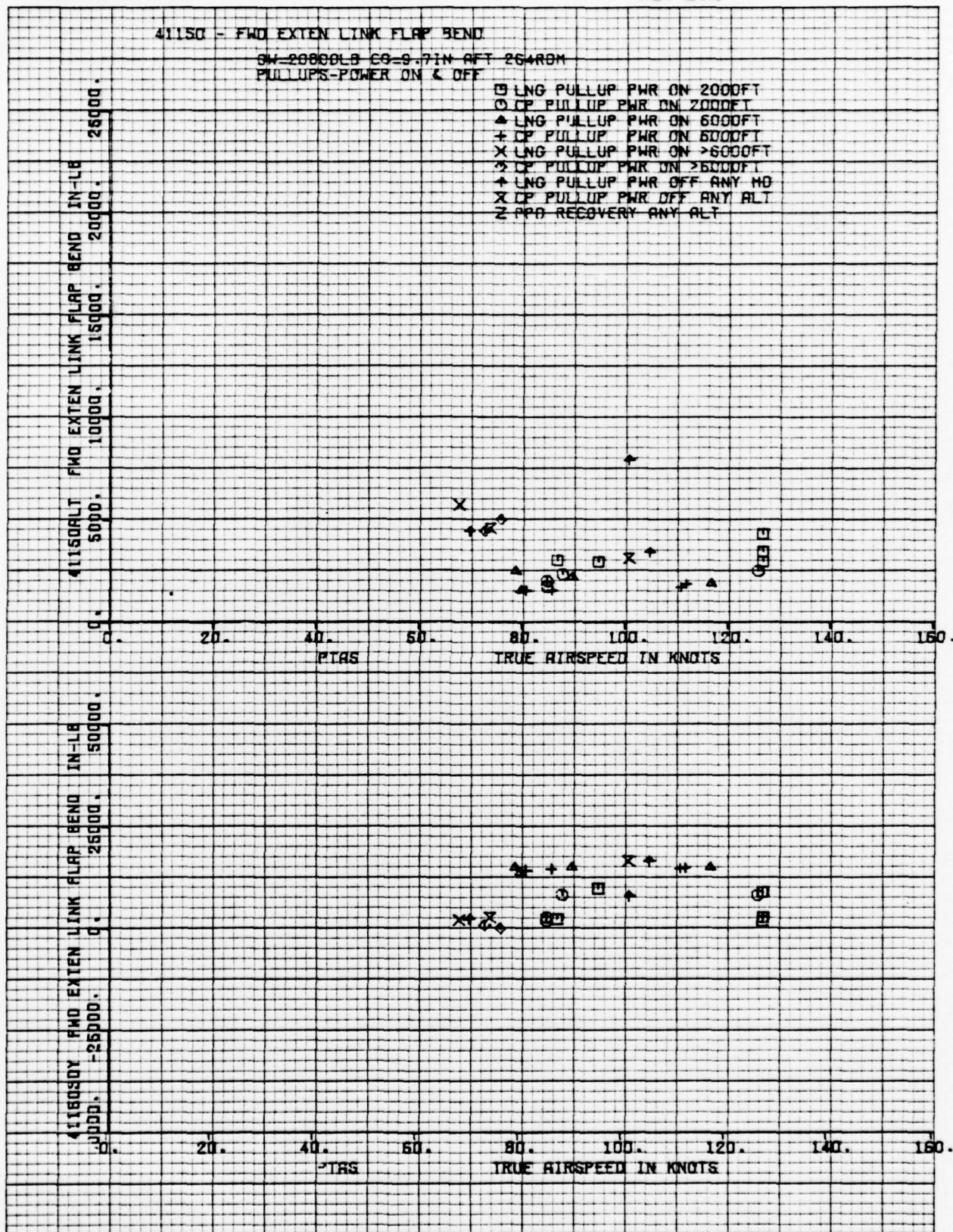
THE **BOEING** COMPANY

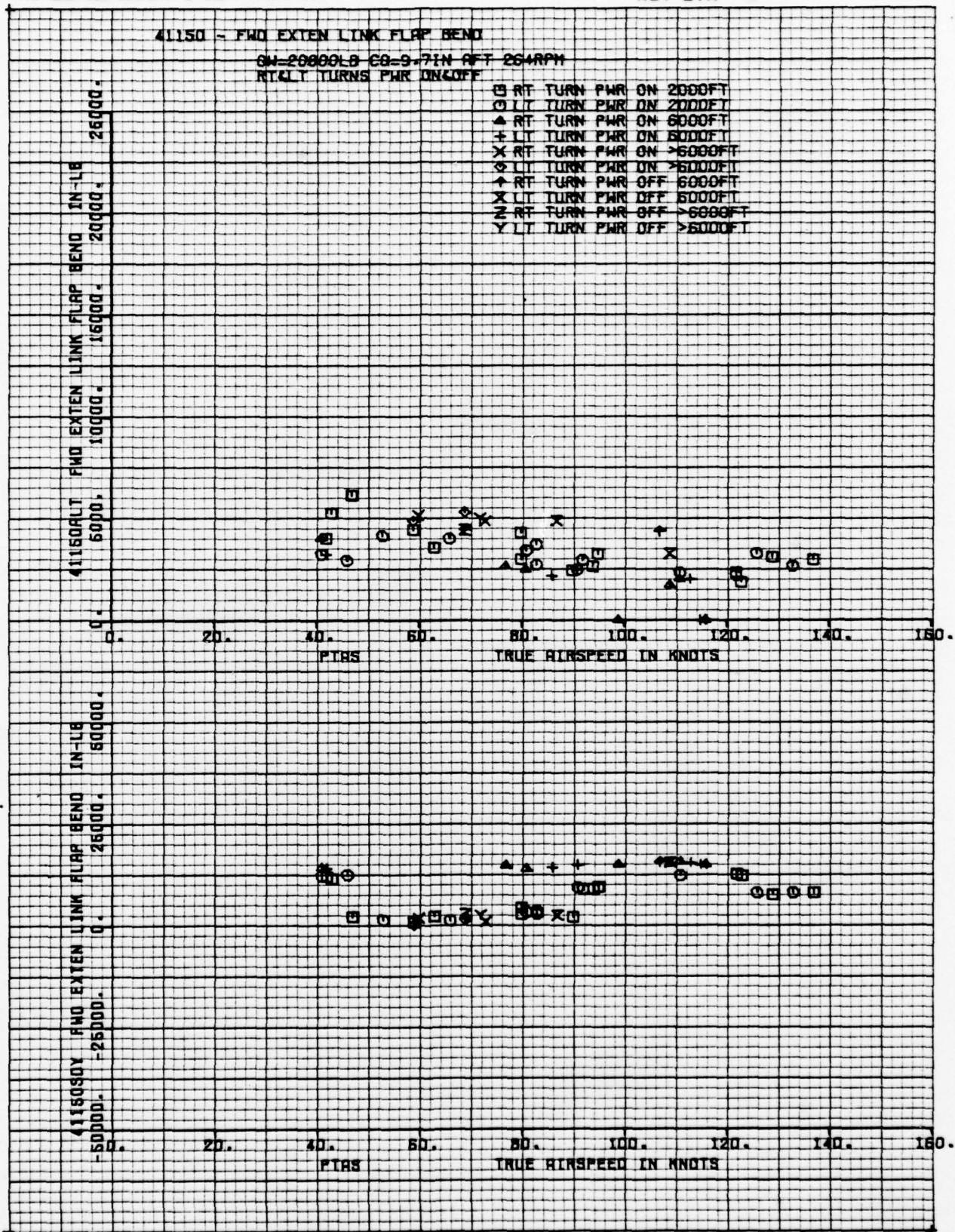
FORM 52300 (10/71)

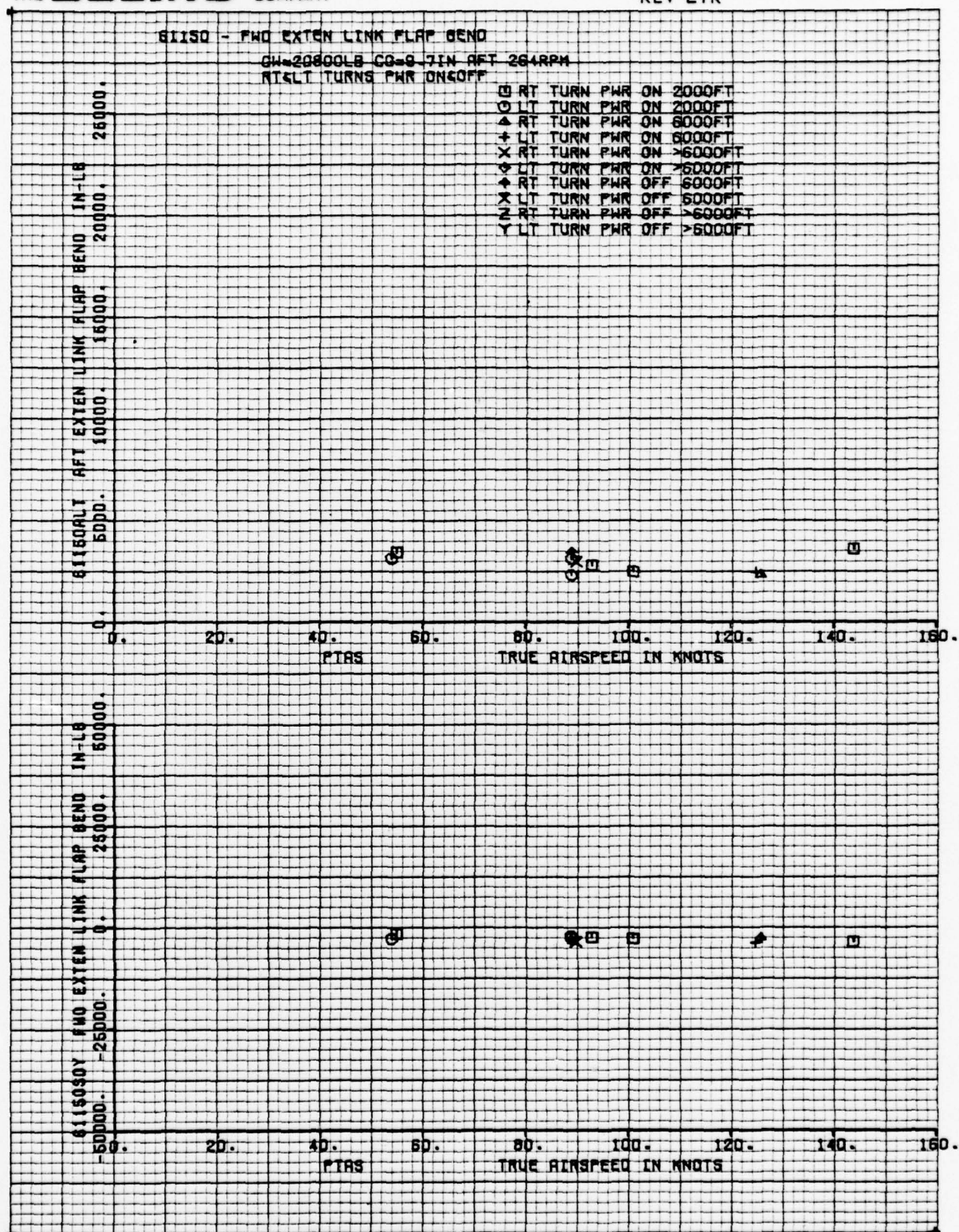
THE **BOEING** COMPANY



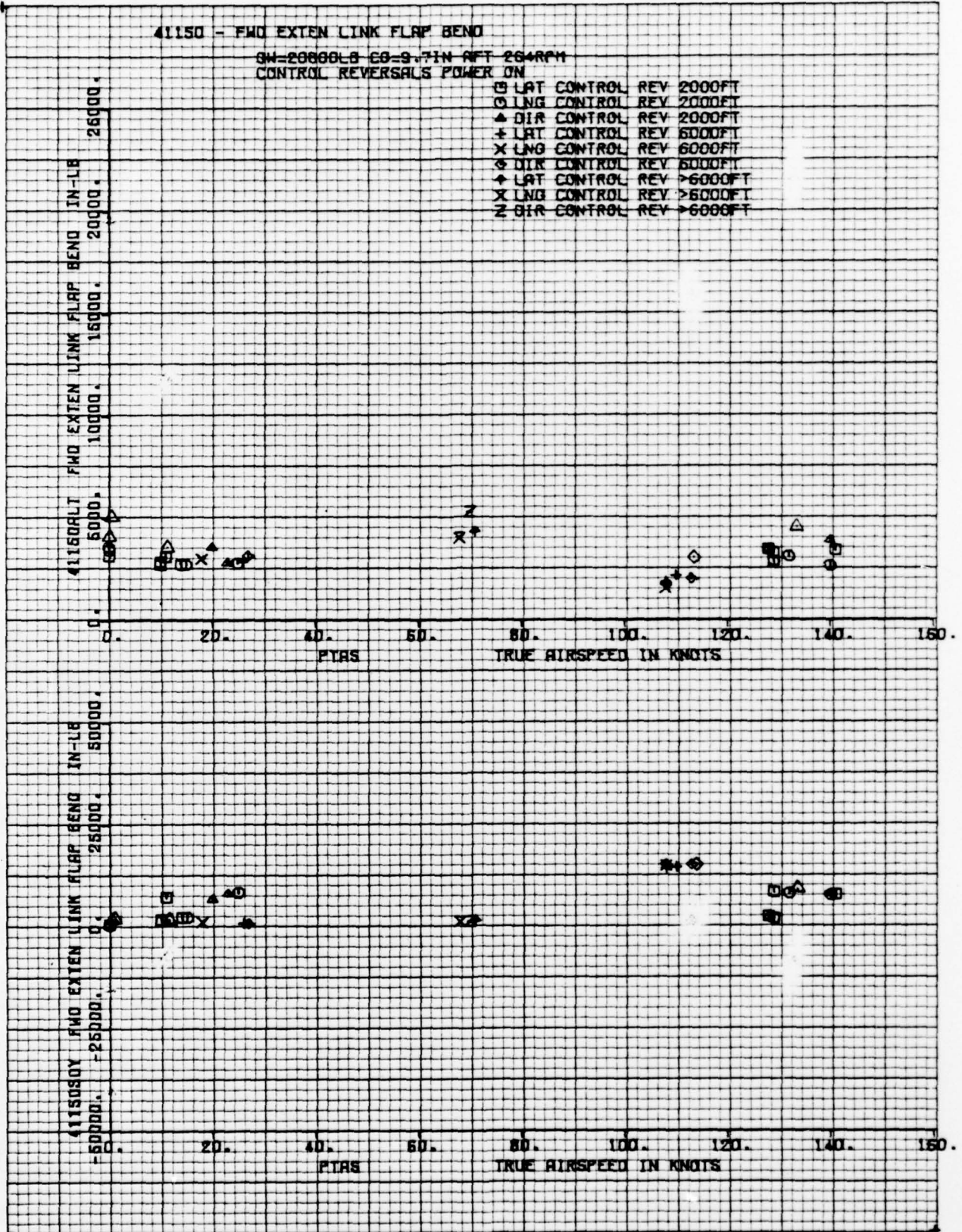
FORM 52300 (10/71)

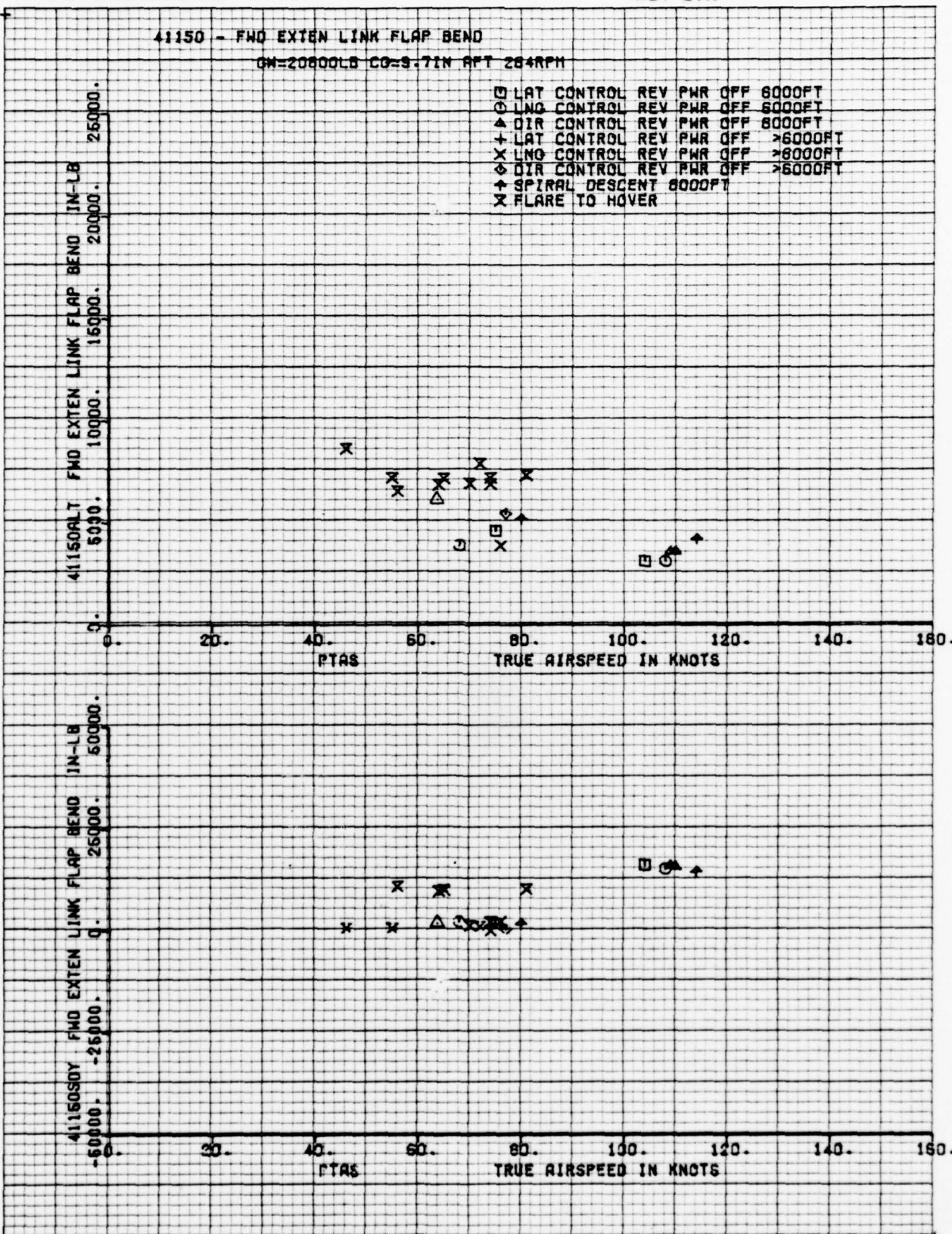


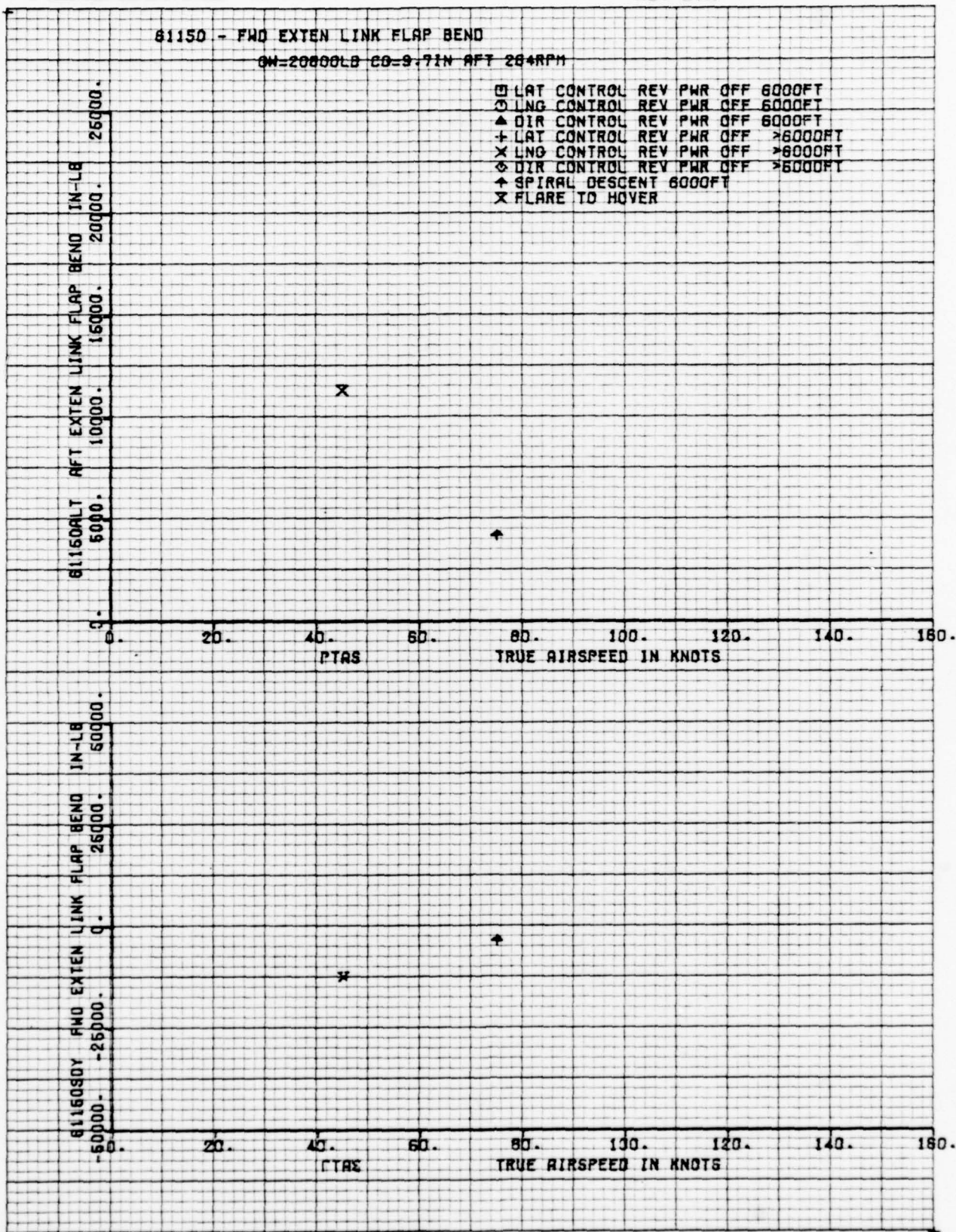


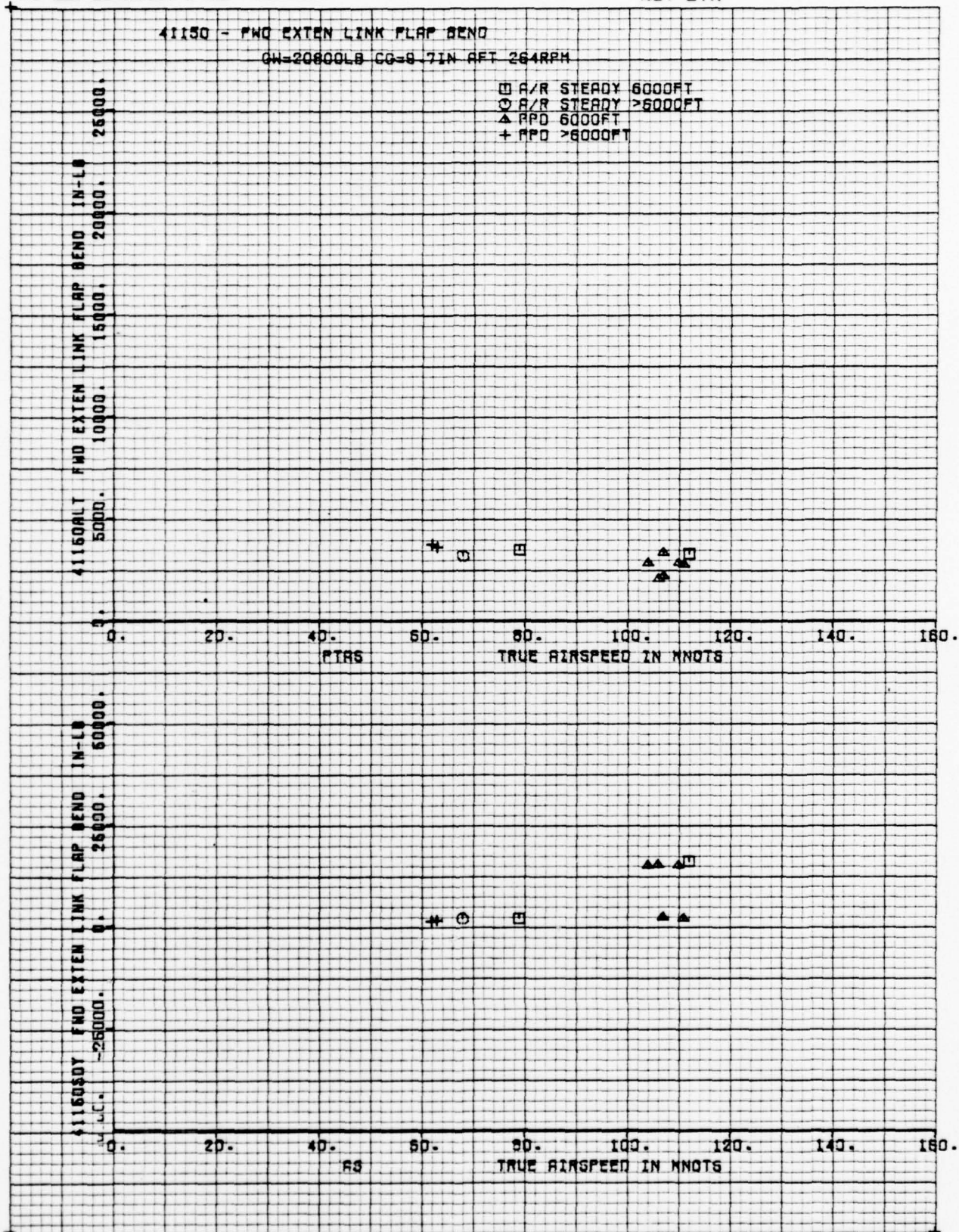


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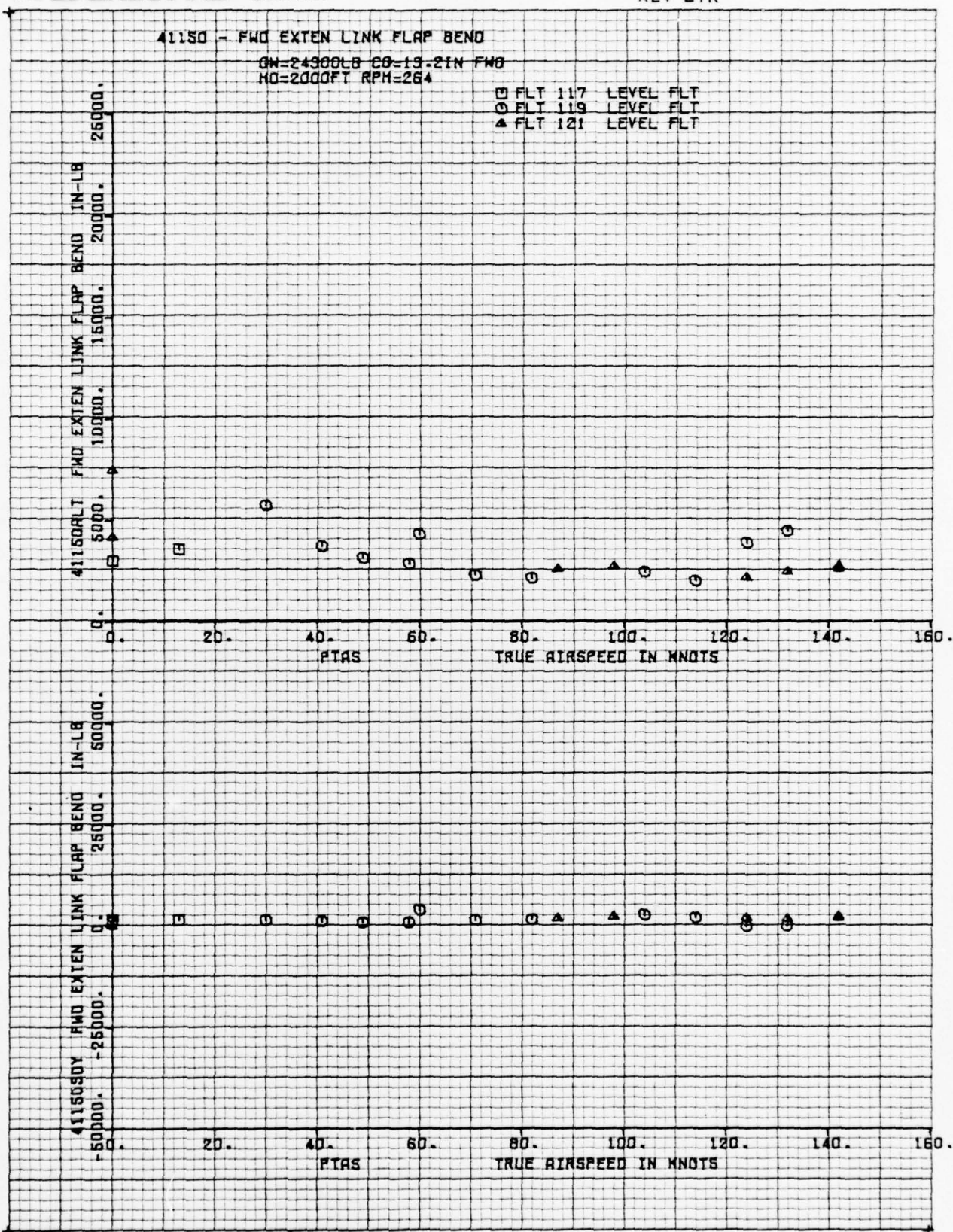


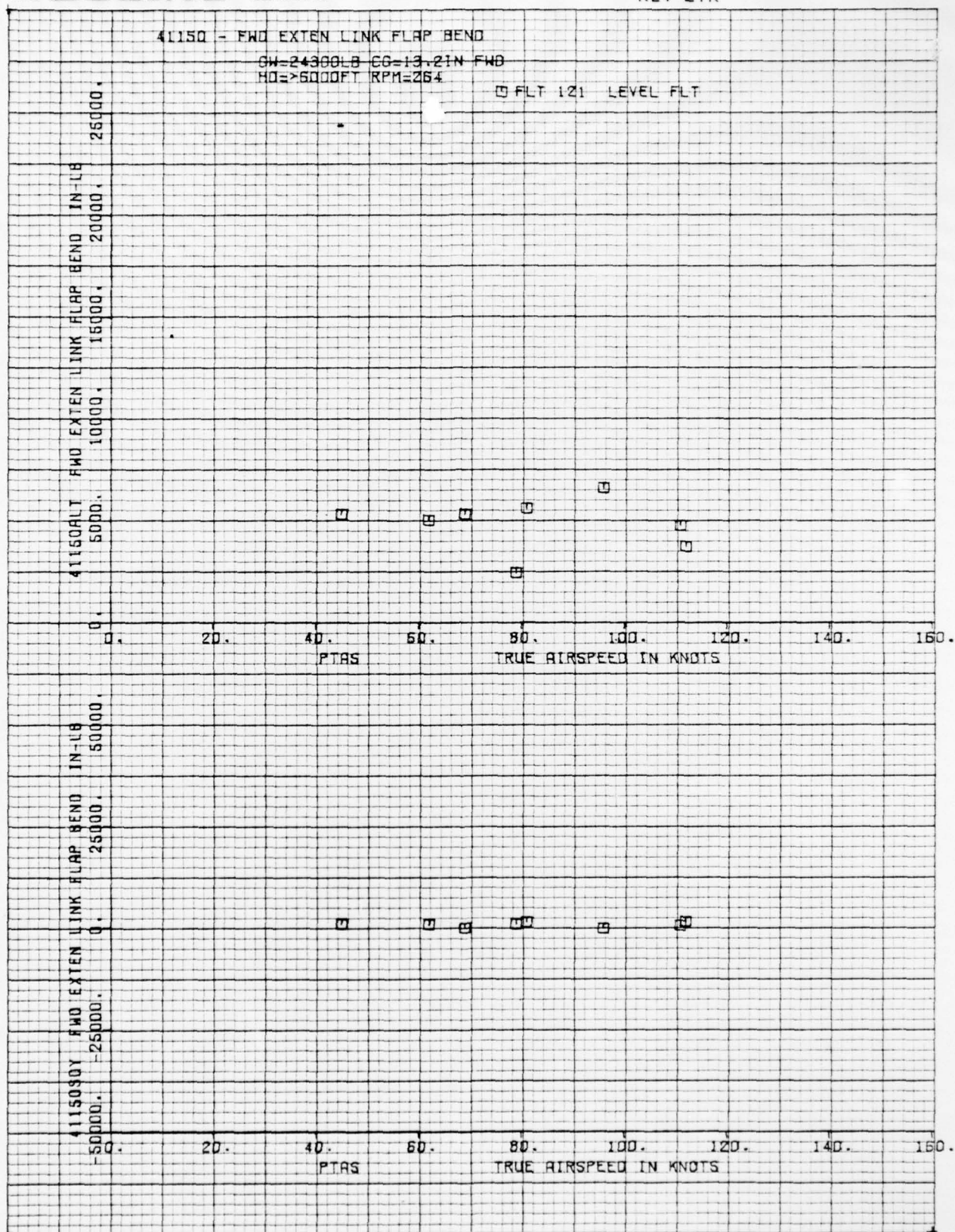




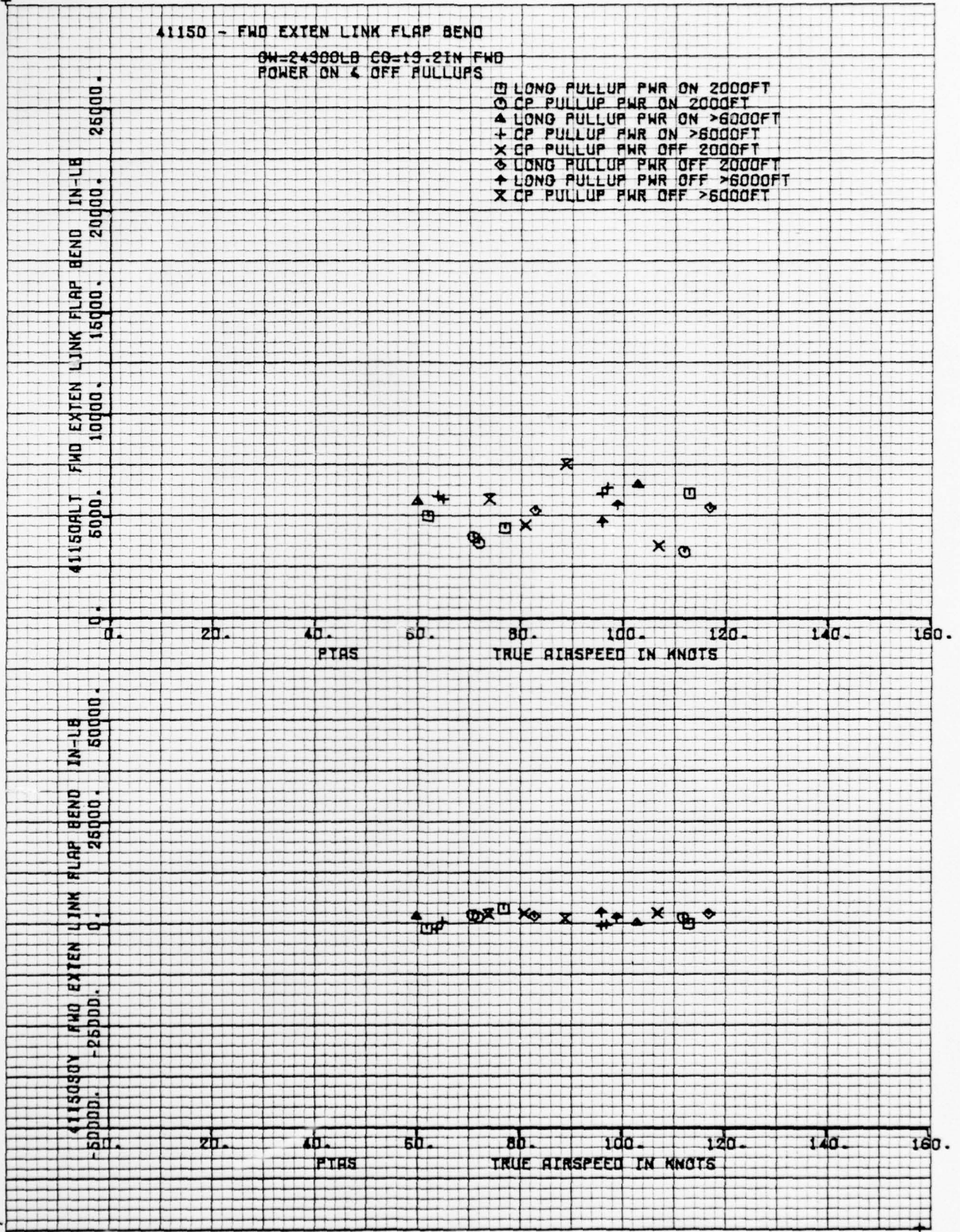
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REV LTRTHE **BOEING** COMPANY

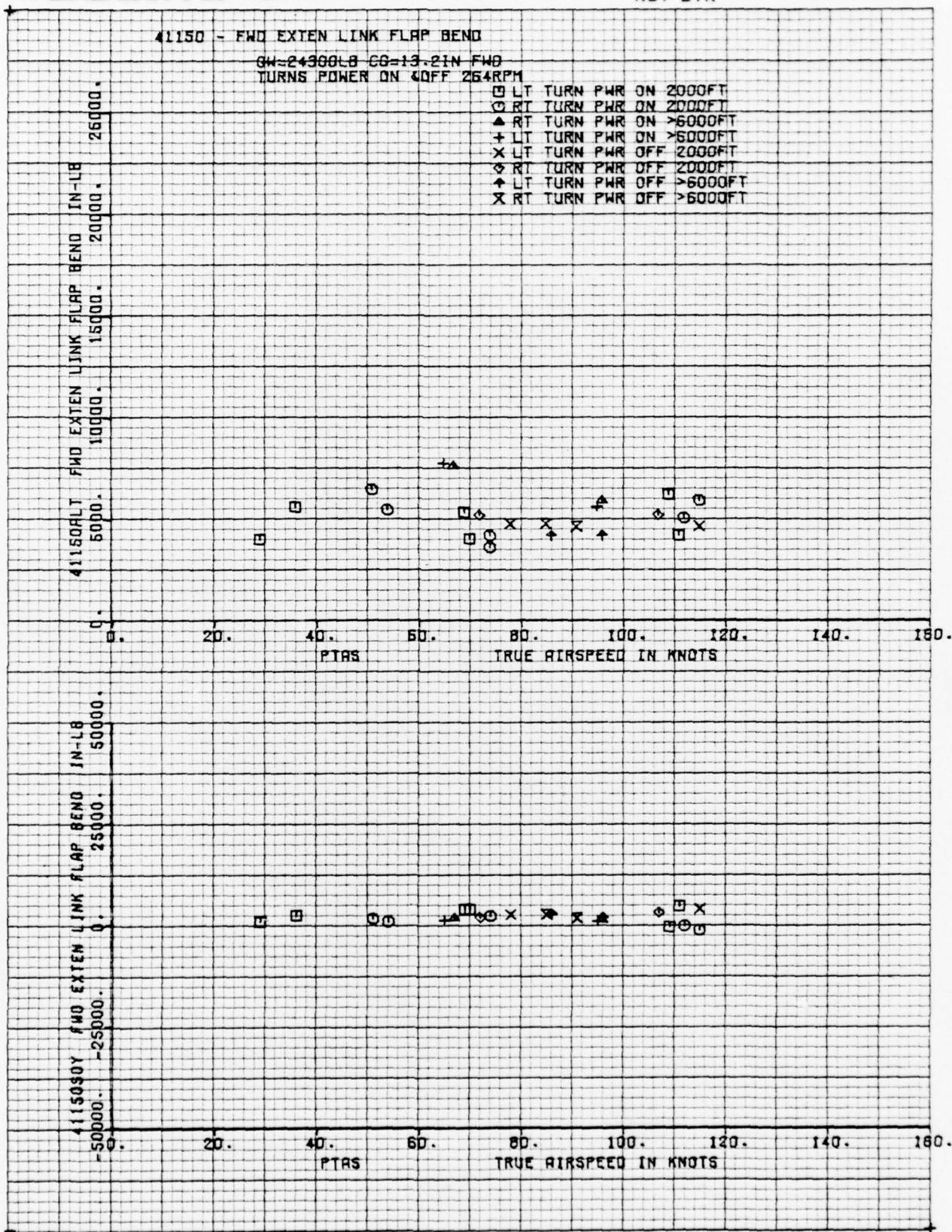
FORM 52300 (10/71)

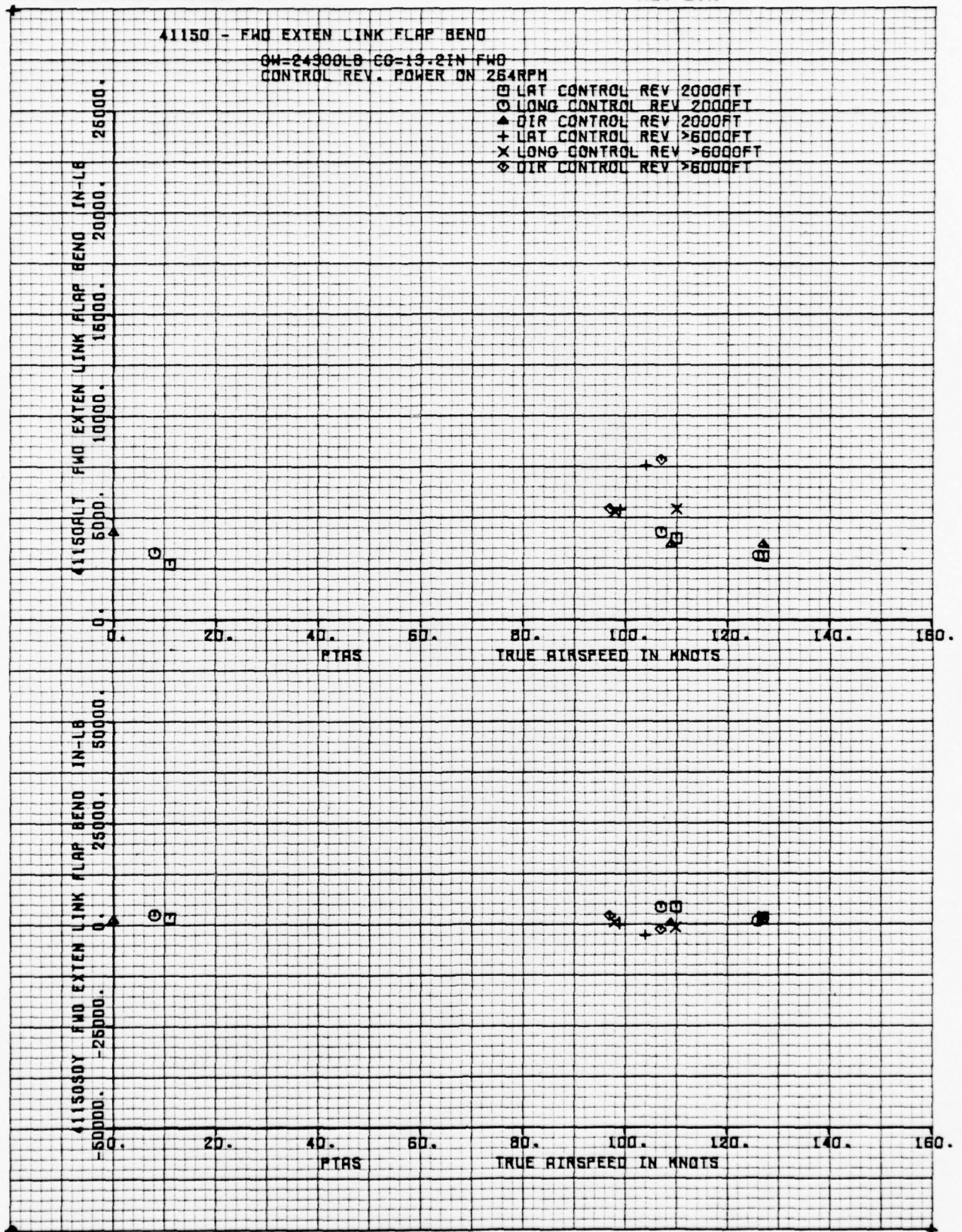


THE **BOEING** COMPANY

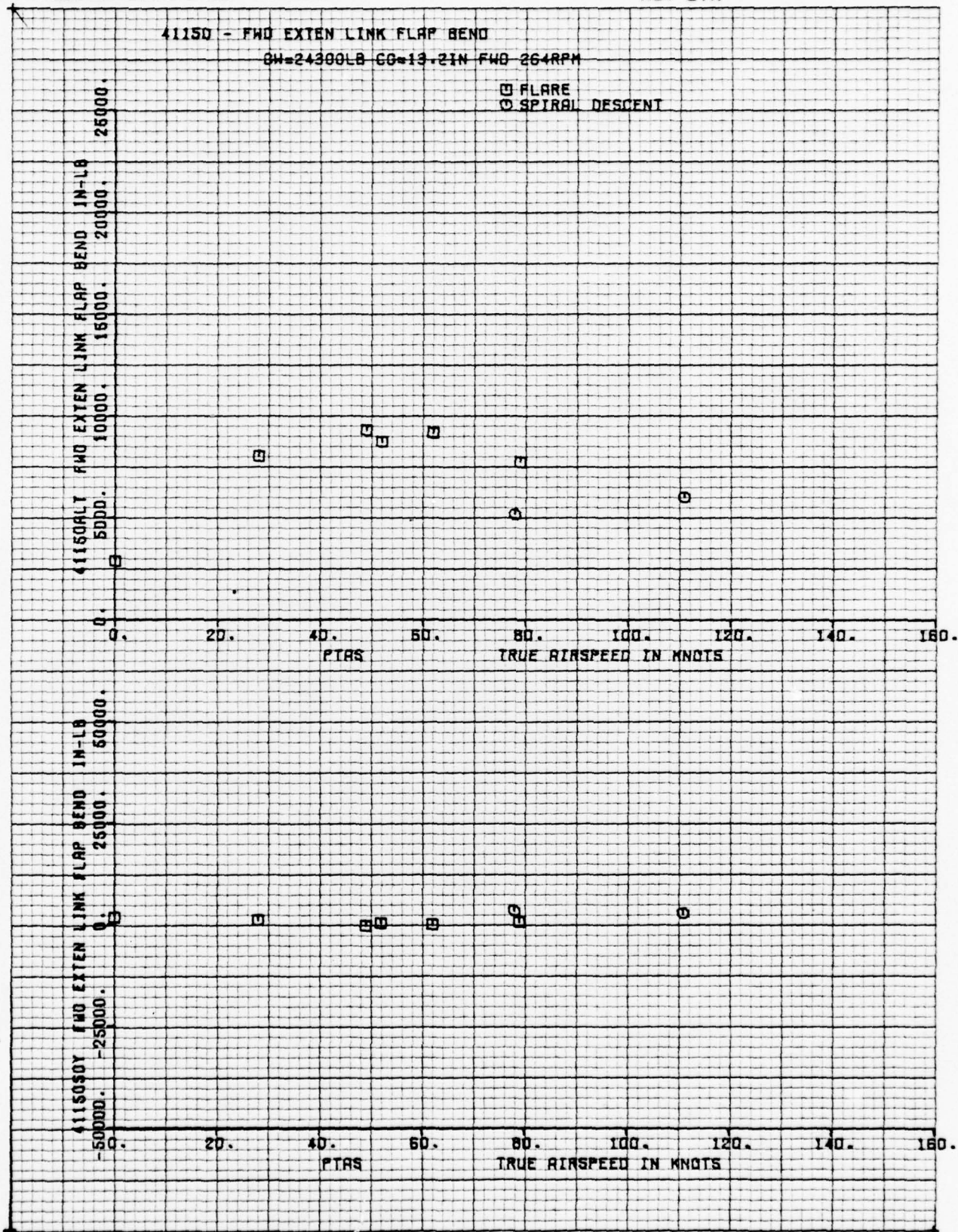
FORM 52300 (10/71)





THE **BOEING** COMPANYNUMBER [VOLUME 2
REV LTR

FORM 52300 (10/71)



FORM 52300 (10/71)

THE **BOEING** COMPANY

41150 - FWD EXTEN LINK FLAP BEND

GW=24300LB CG=19.2IN FWD
PPD & AUTOROTATIONS

- PPD 2000FT
- AUTOROTATION 2000FT
- ▲ PPD >6000FT
- + AUTOROTATION >6000FT
- × PPD REC 2000FT
- ◇ PPD REC >6000FT

41160ALT FWD EXTEN LINK FLAP BEND IN-LB

25000.

20000.

15000.

10000.

5000.

0.

20.

40.

60.

80.

100.

120.

140.

160.

PTAS

TRUE AIRSPEED IN KNOTS

41160SOY FWD EXTEN LINK FLAP BEND IN-LB

50000.

25000.

0.

-25000.

-50000.

20.

40.

60.

80.

100.

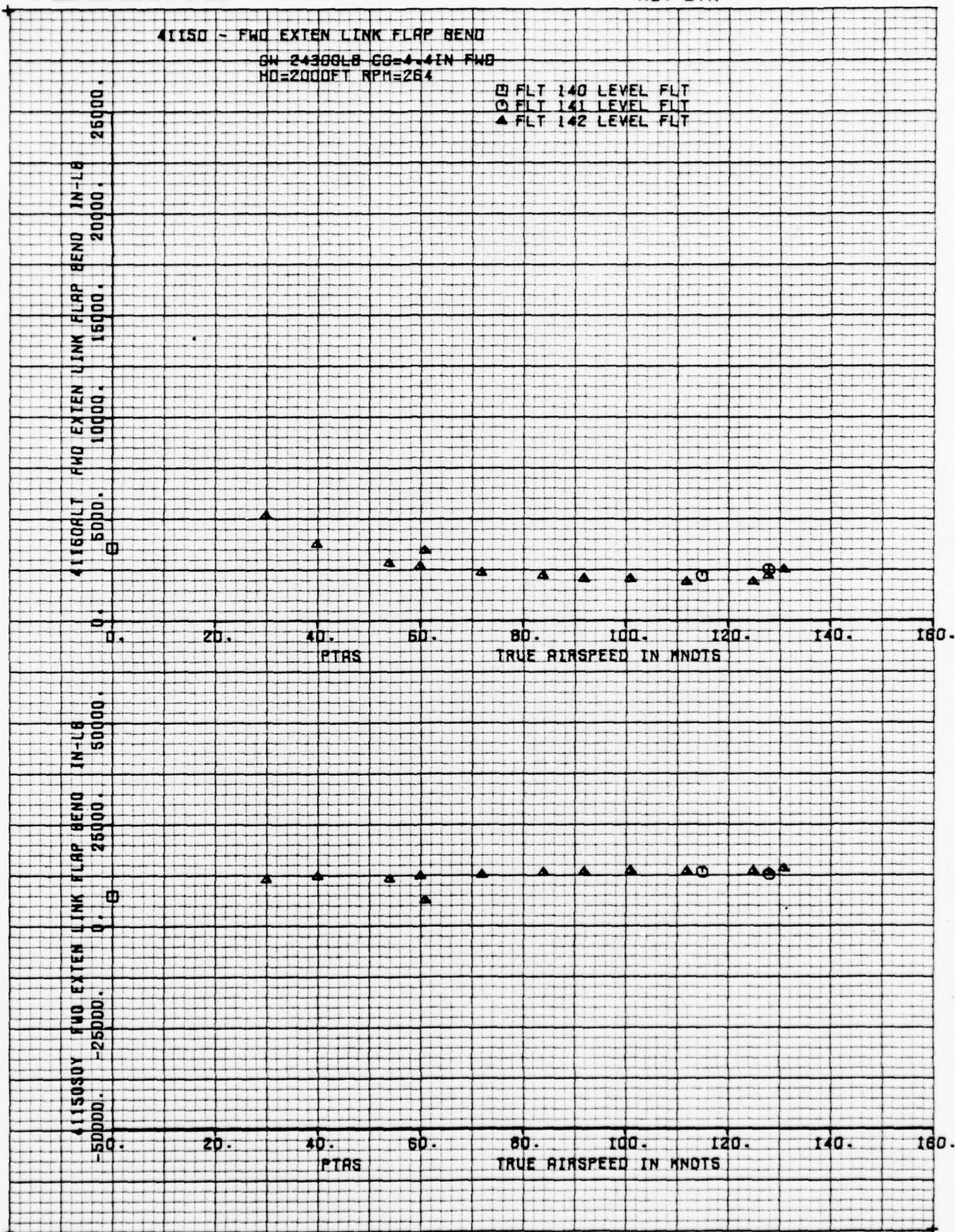
120.

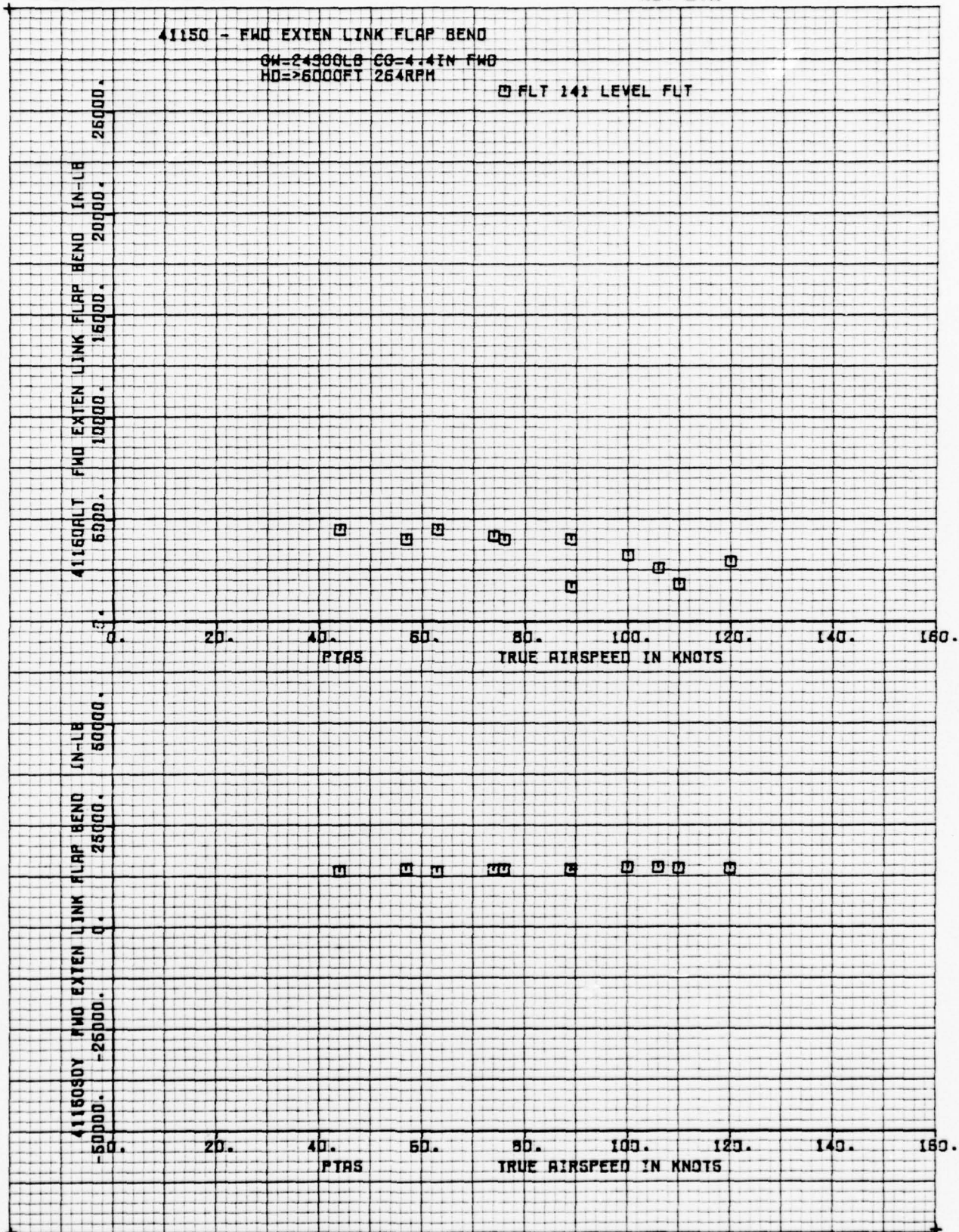
140.

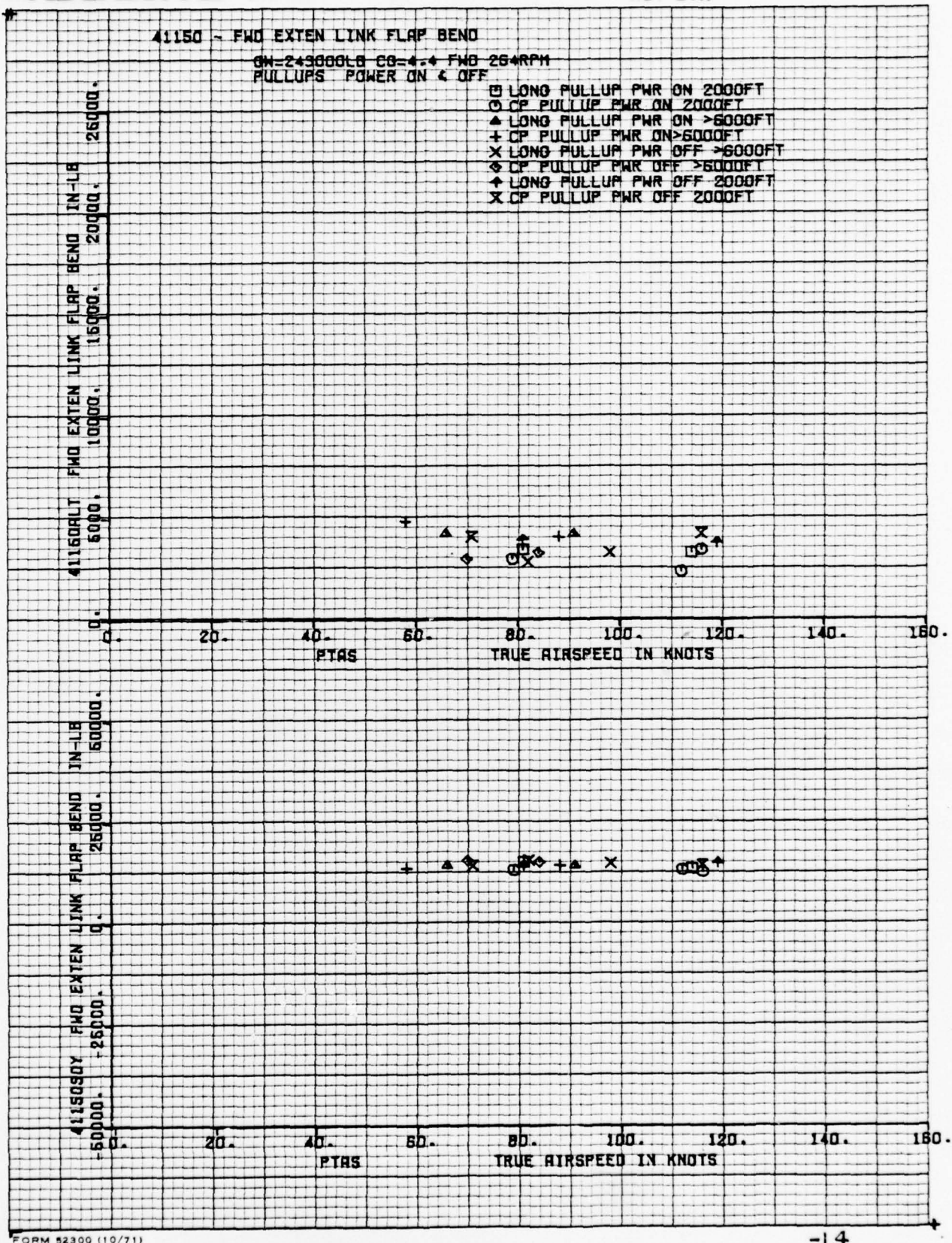
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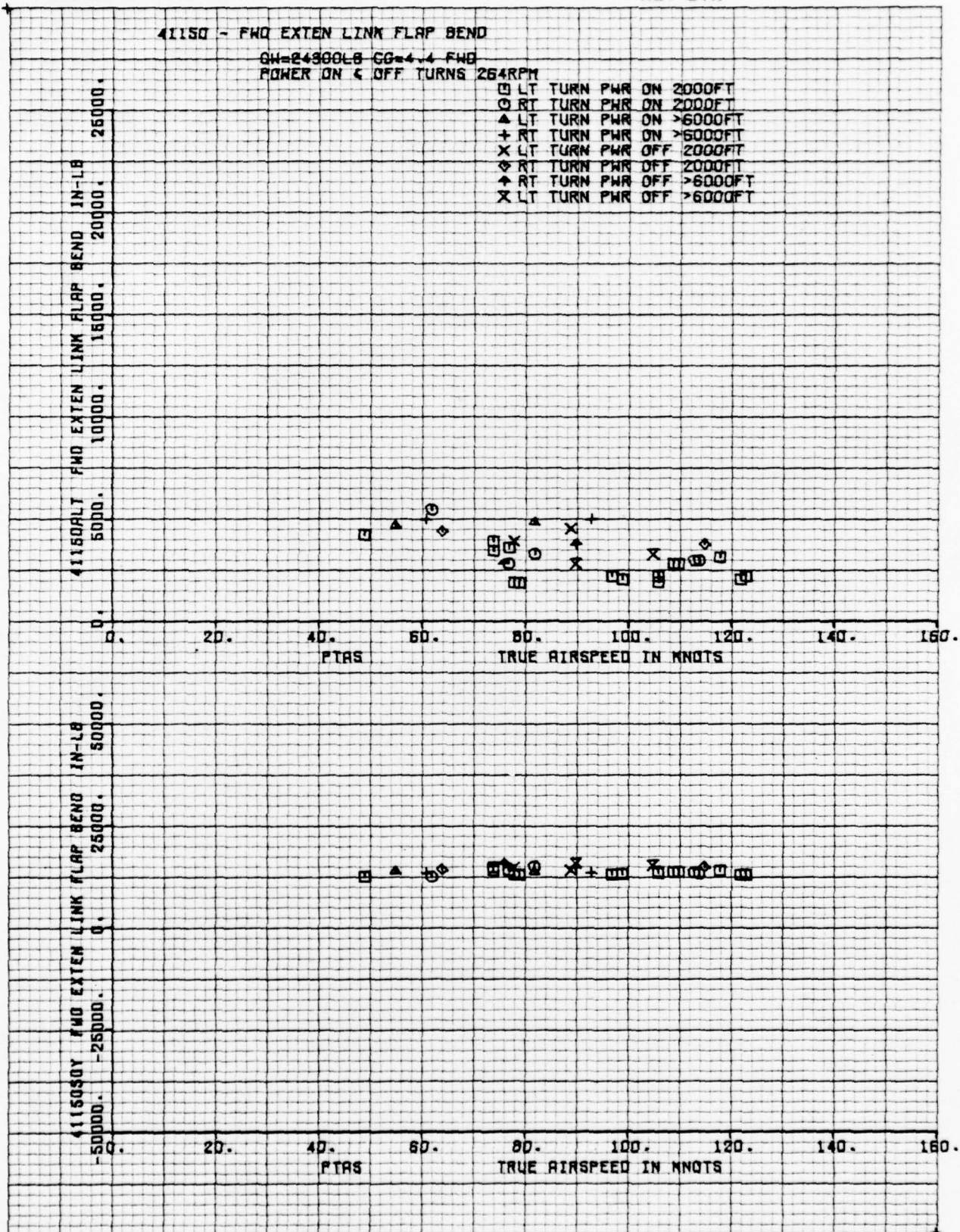
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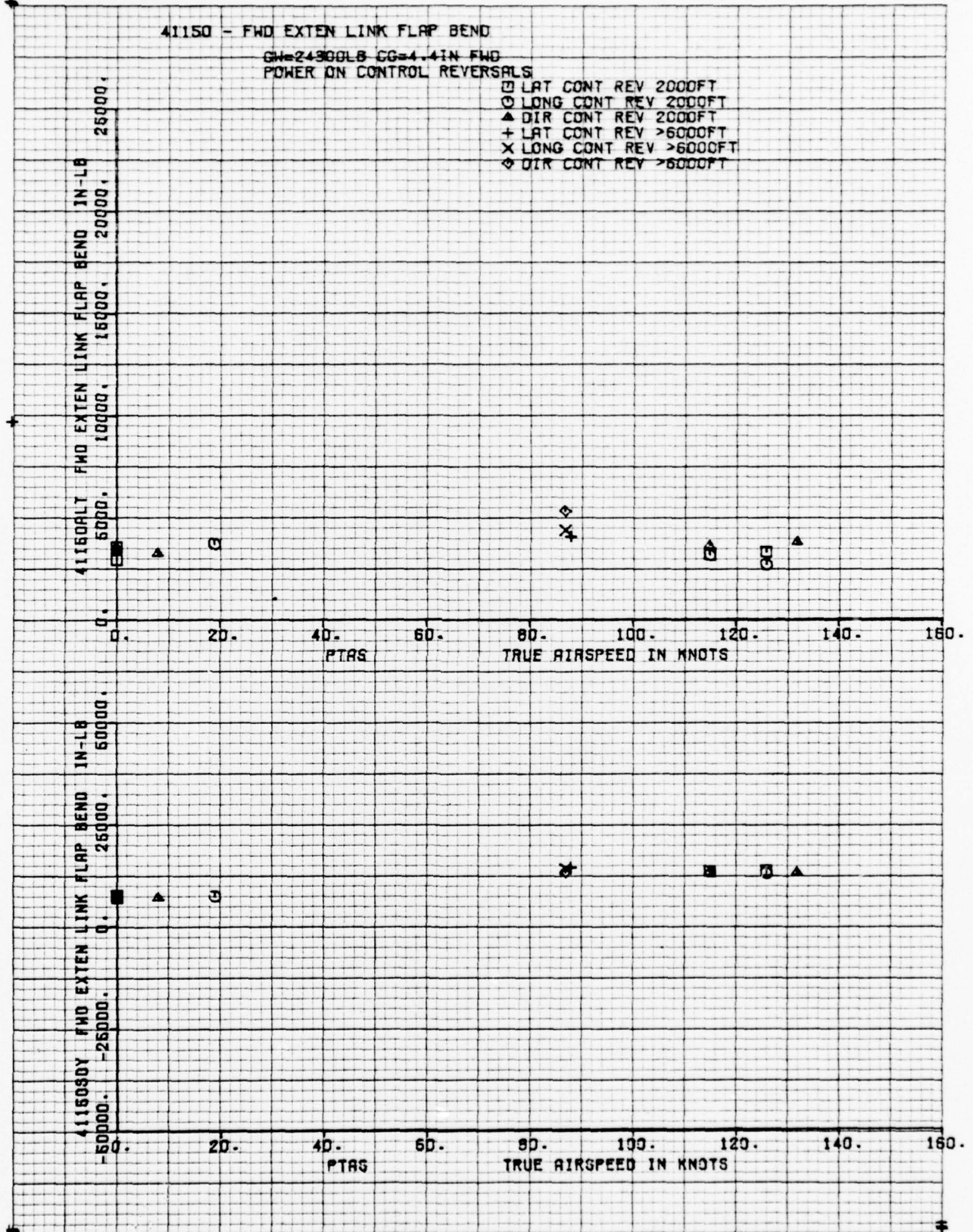
TRUE AIRSPEED IN KNOTS

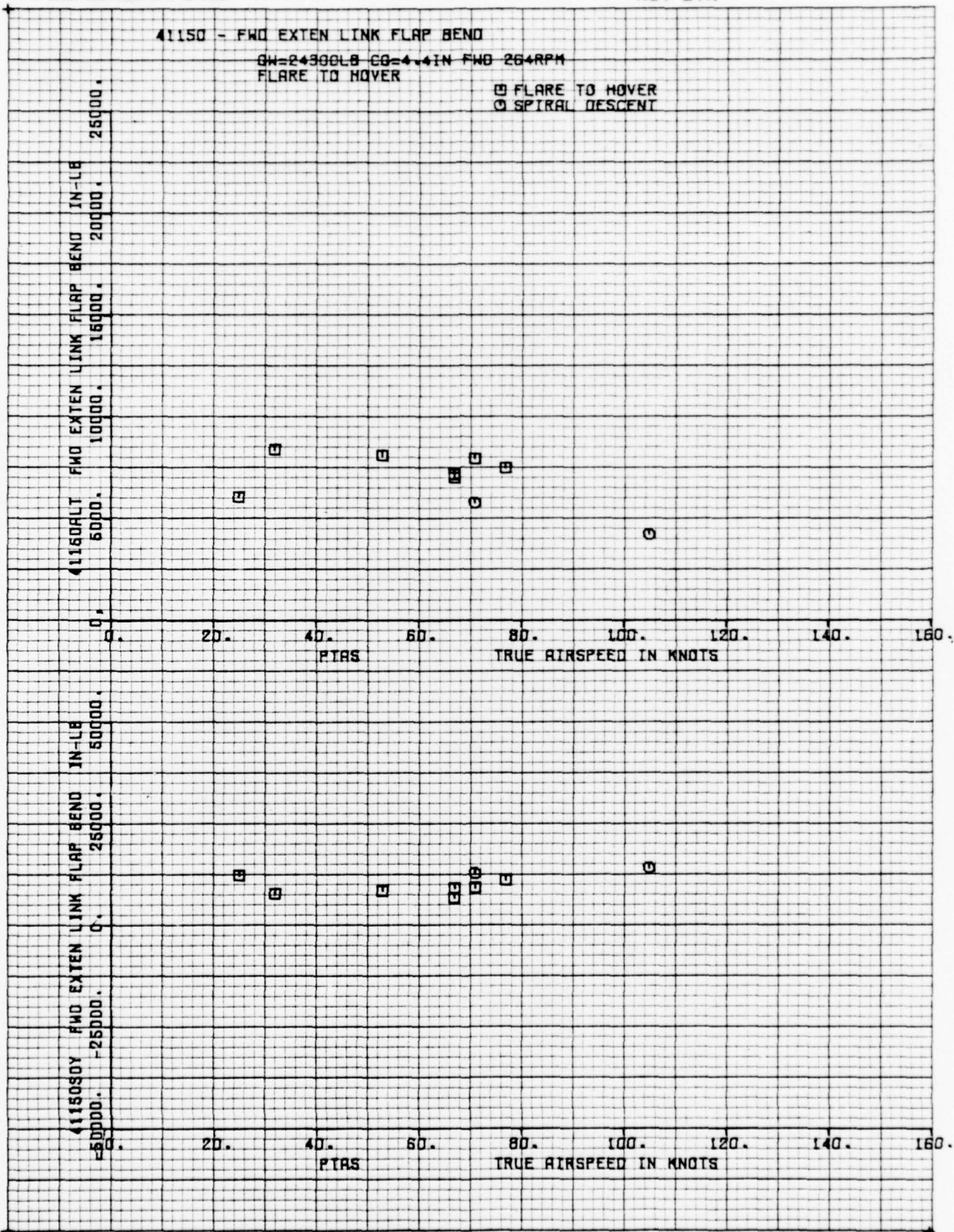


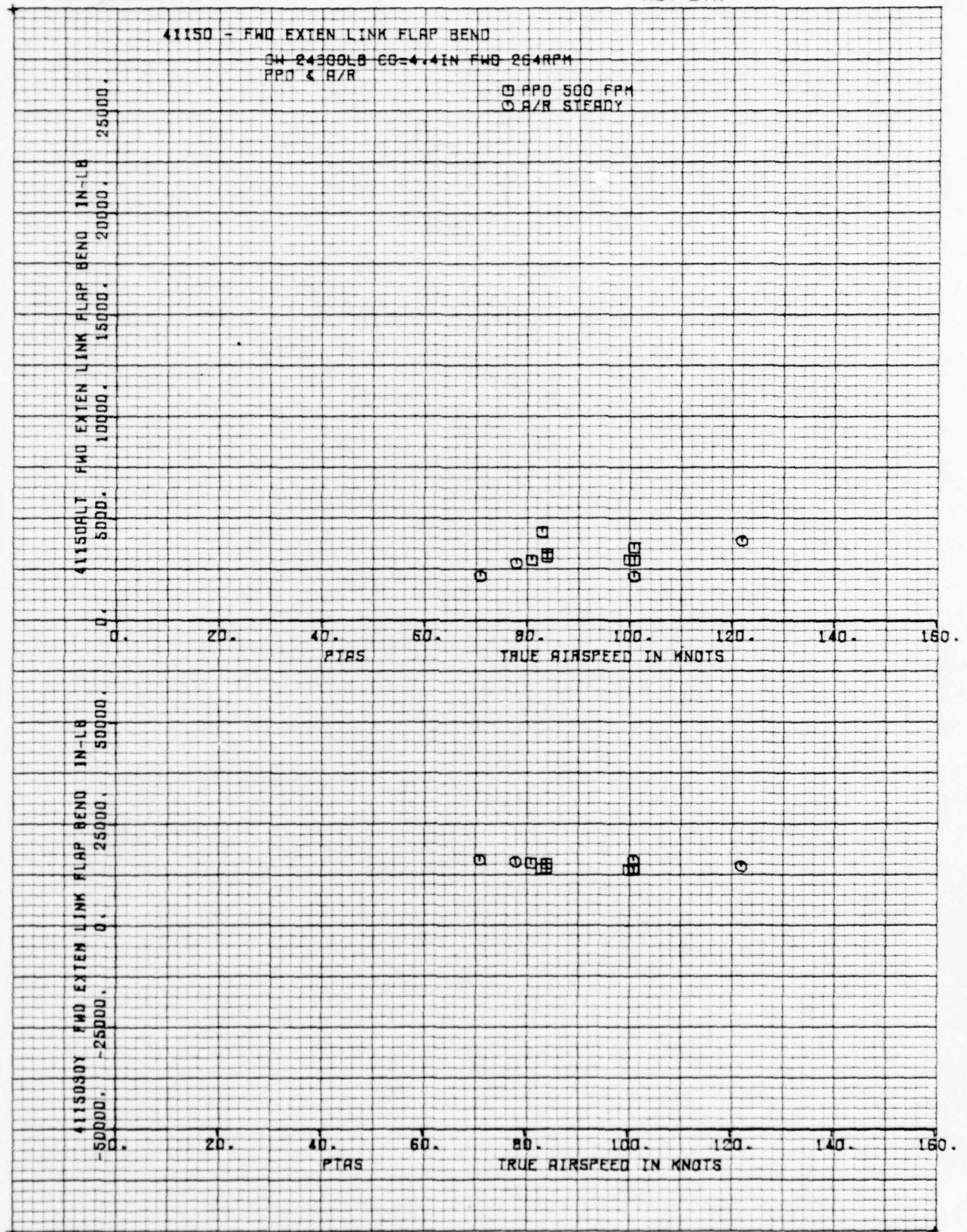




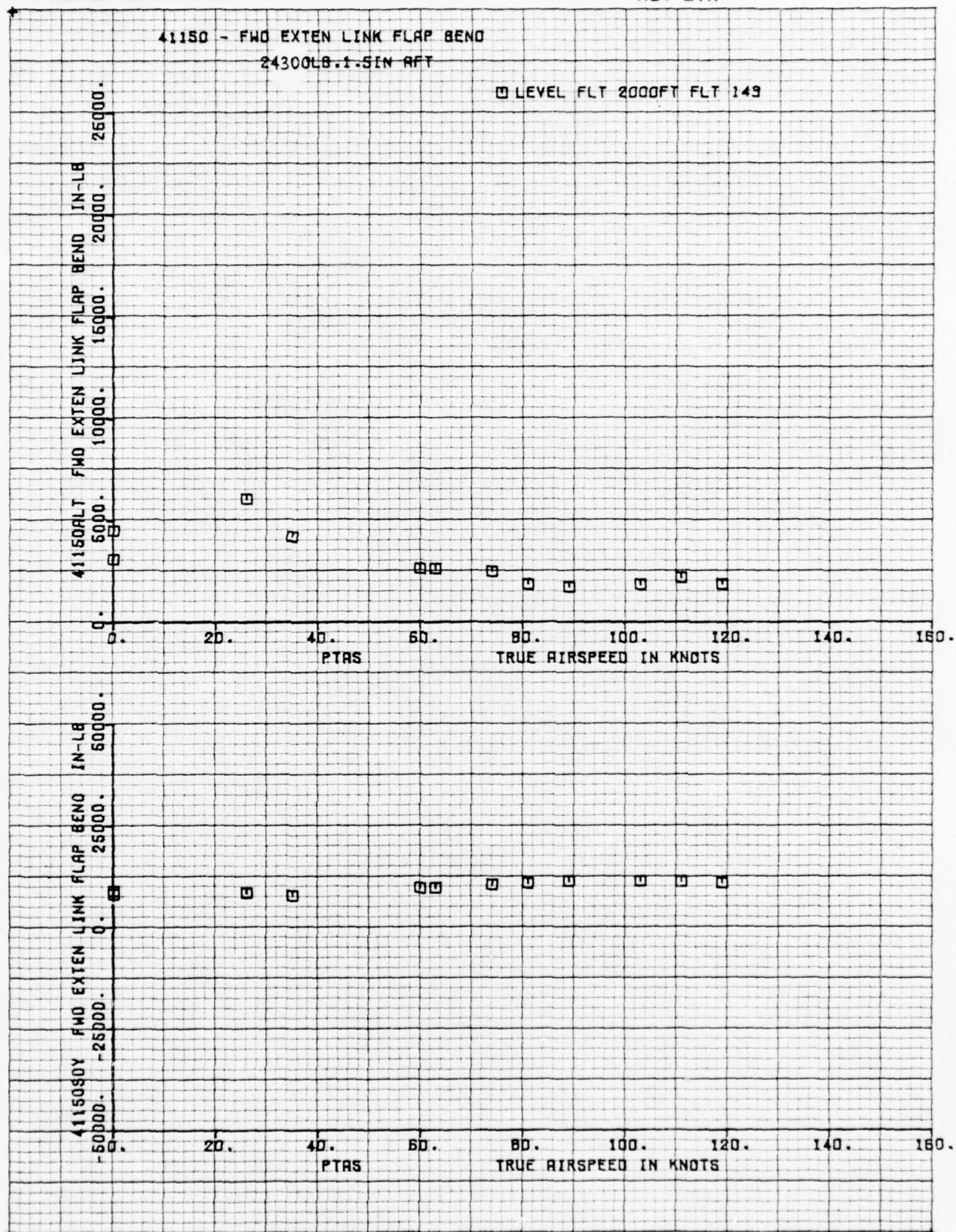






THE **BOEING** COMPANY

FORM 52300 (10/71)



THE **BOEING** COMPANY

PREPARED BY: J. Bendo

CHECKED BY:

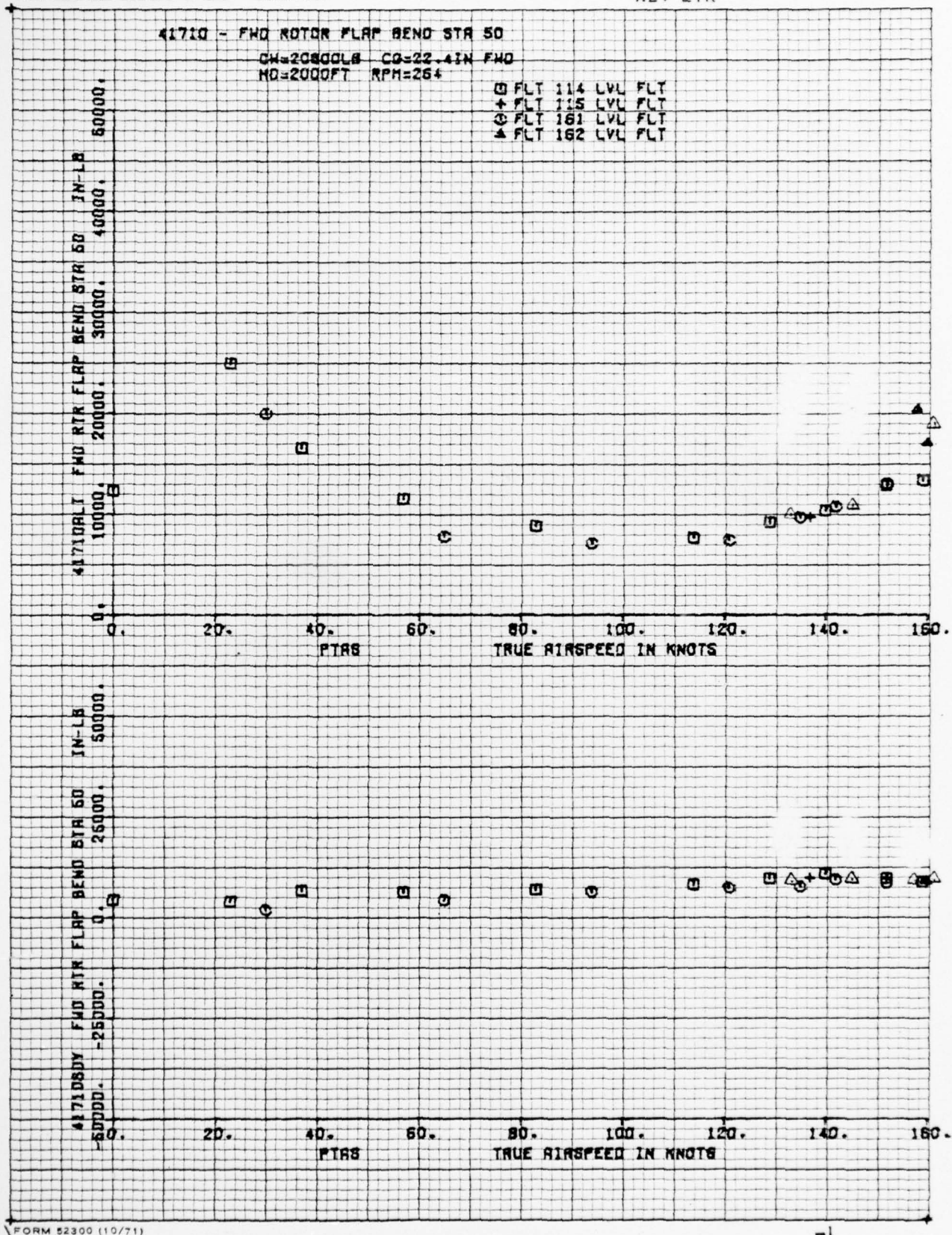
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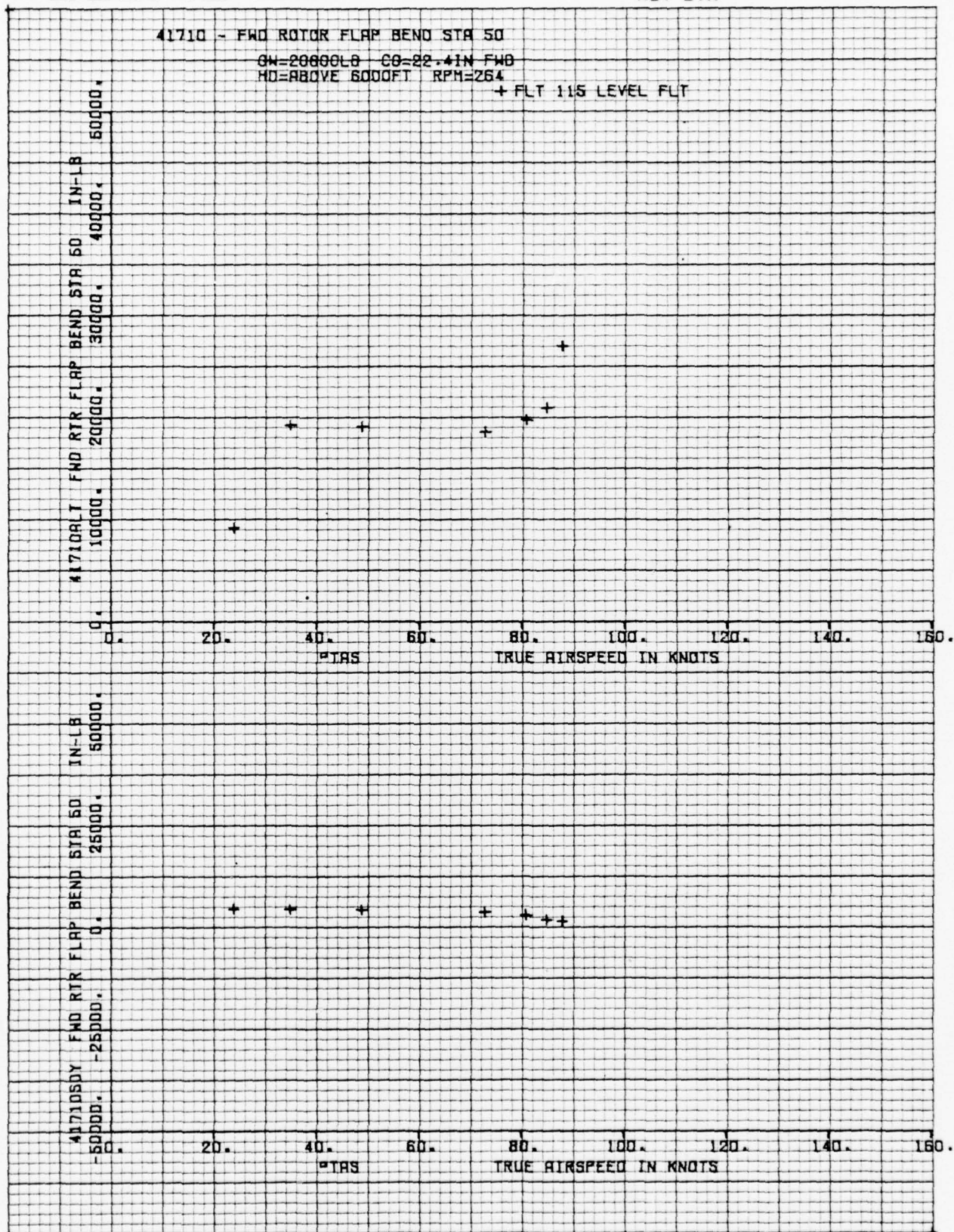
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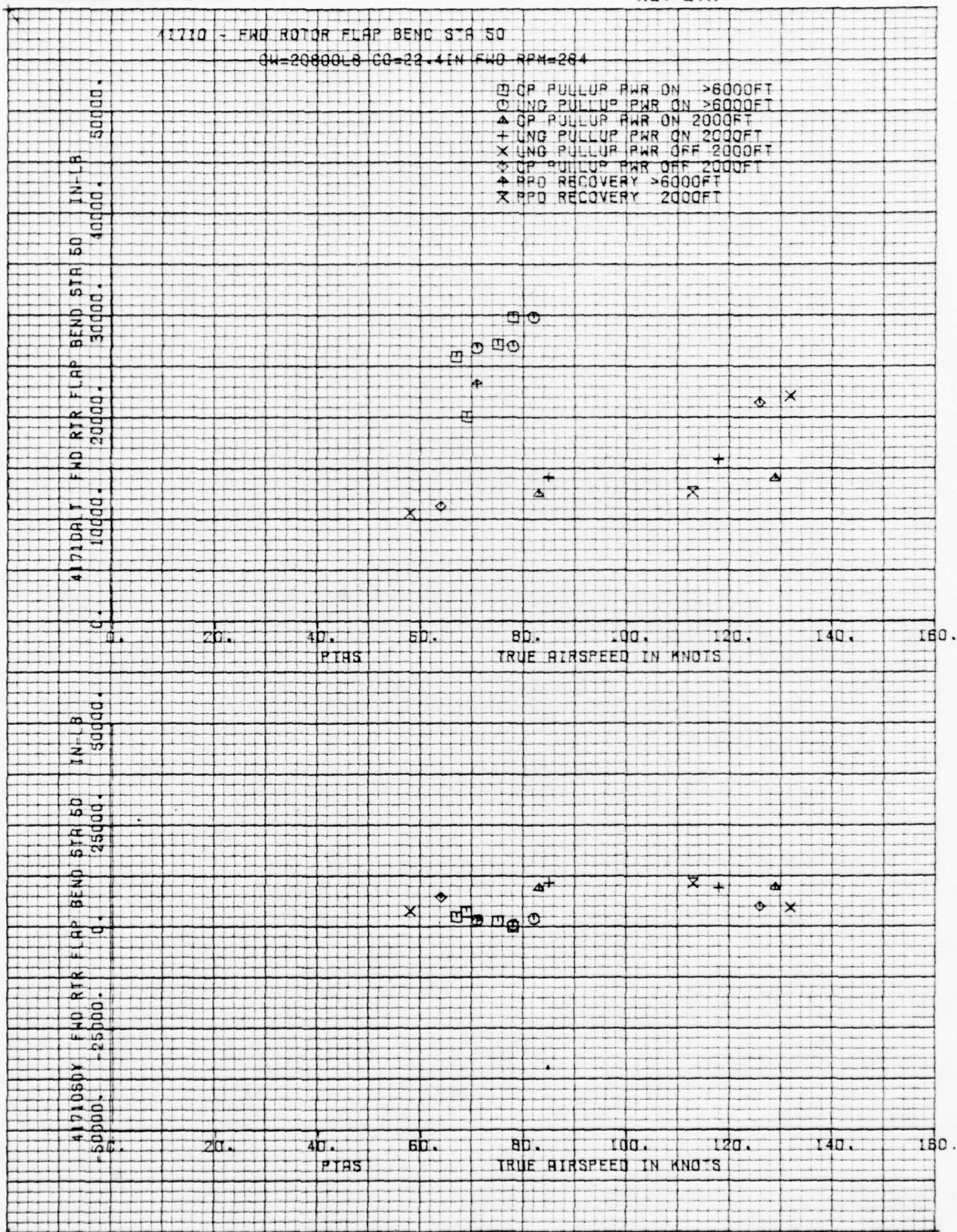
REV LTR Volume 2

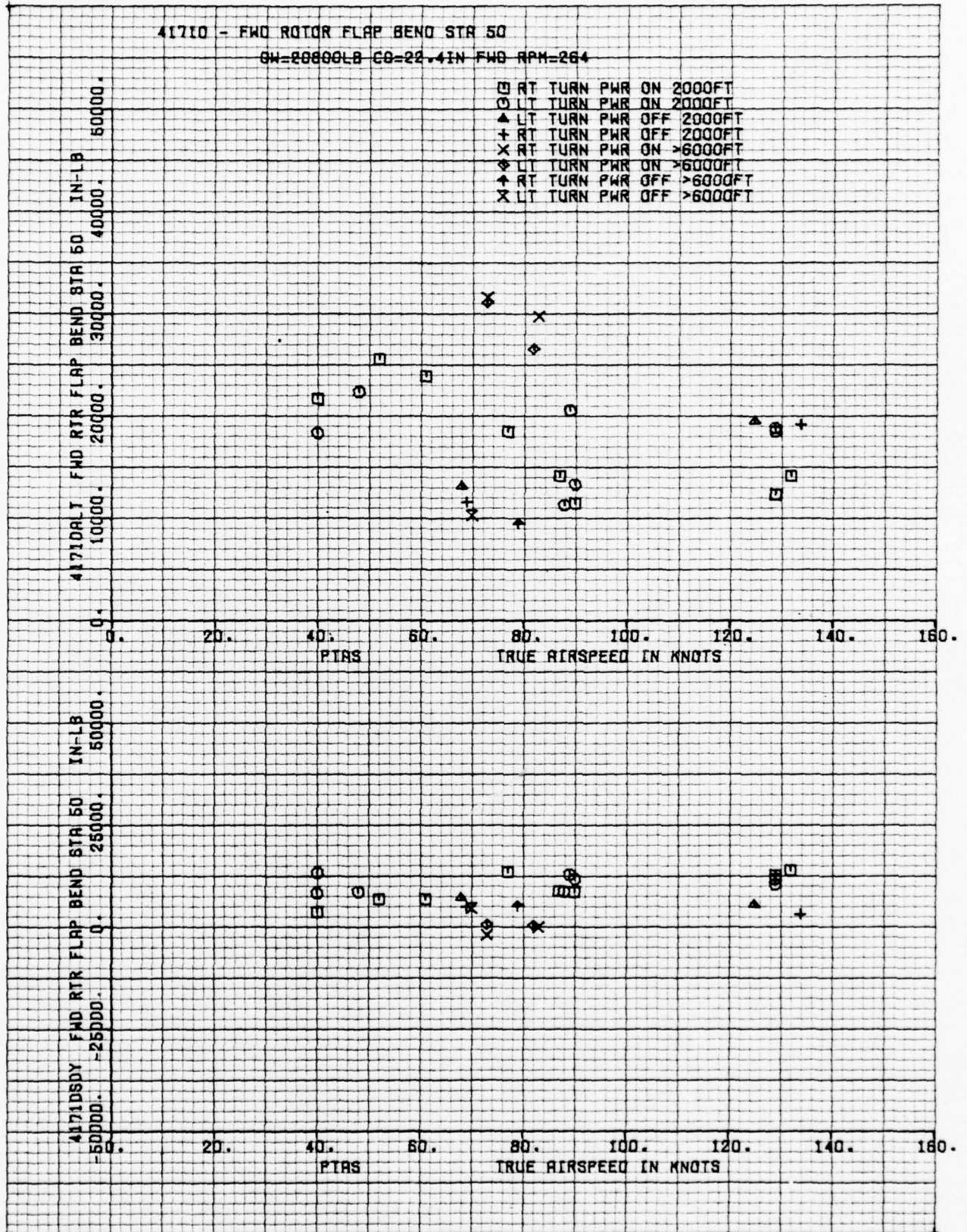
MODEL NO.

4.5 Forward Blade Flap Bending Station 50.







THE **BOEING** COMPANY

FORM 52300 (11/71)

SHEET 153

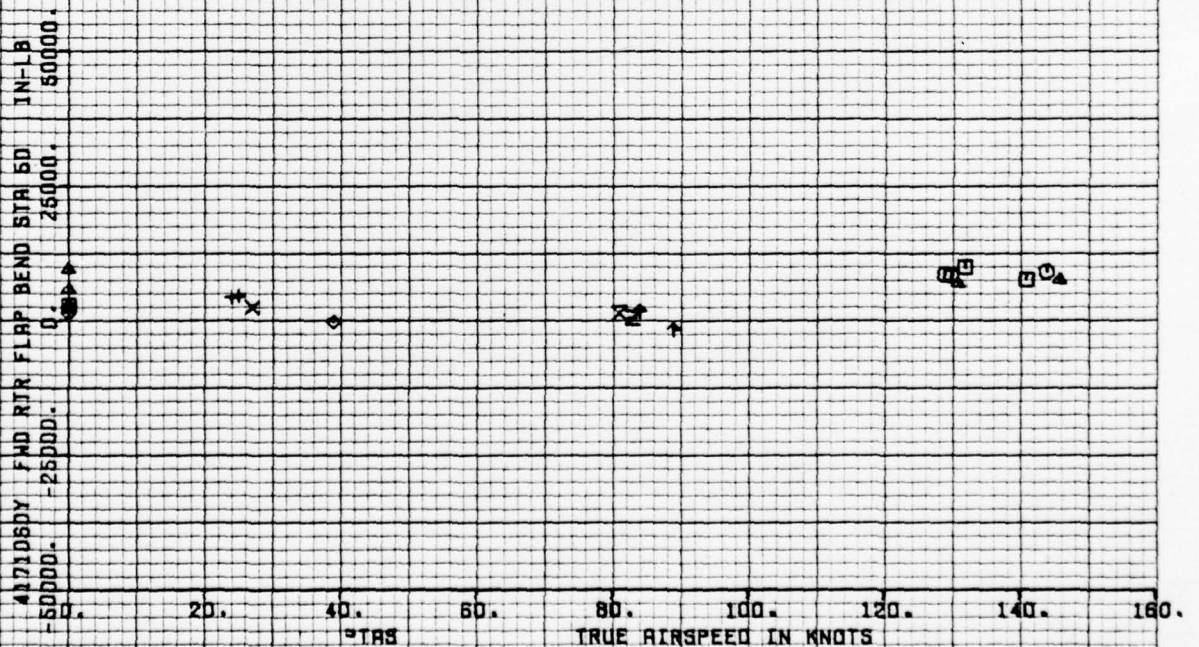
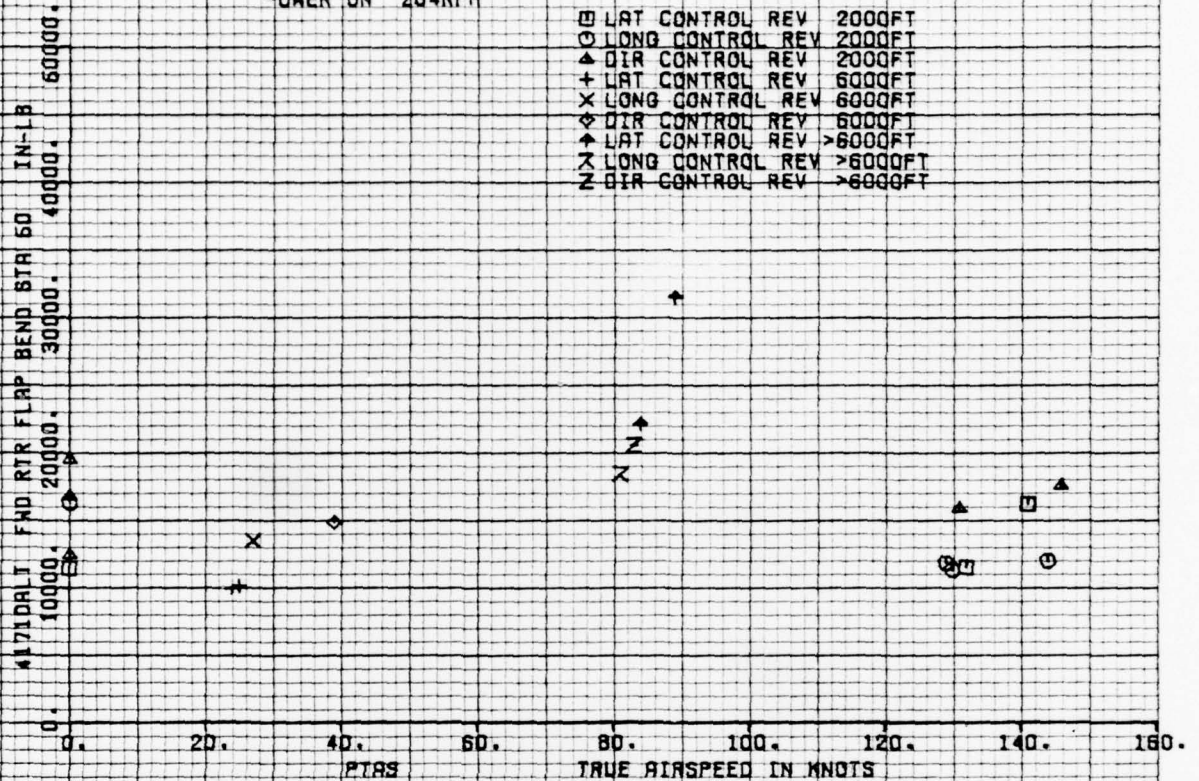
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THE **BOEING** COMPANY

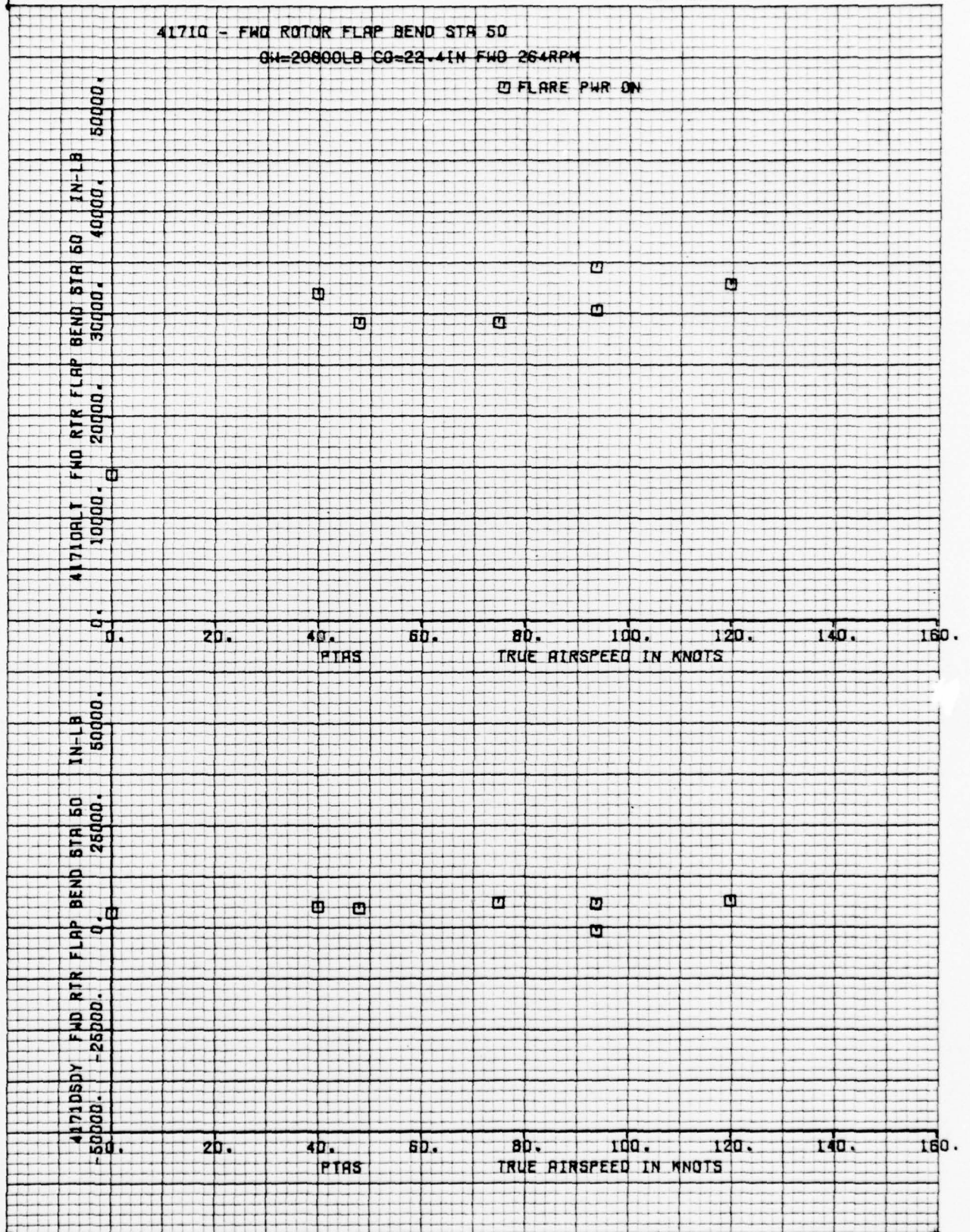
41710 - FWD ROTOR FLAP BEND STA 50

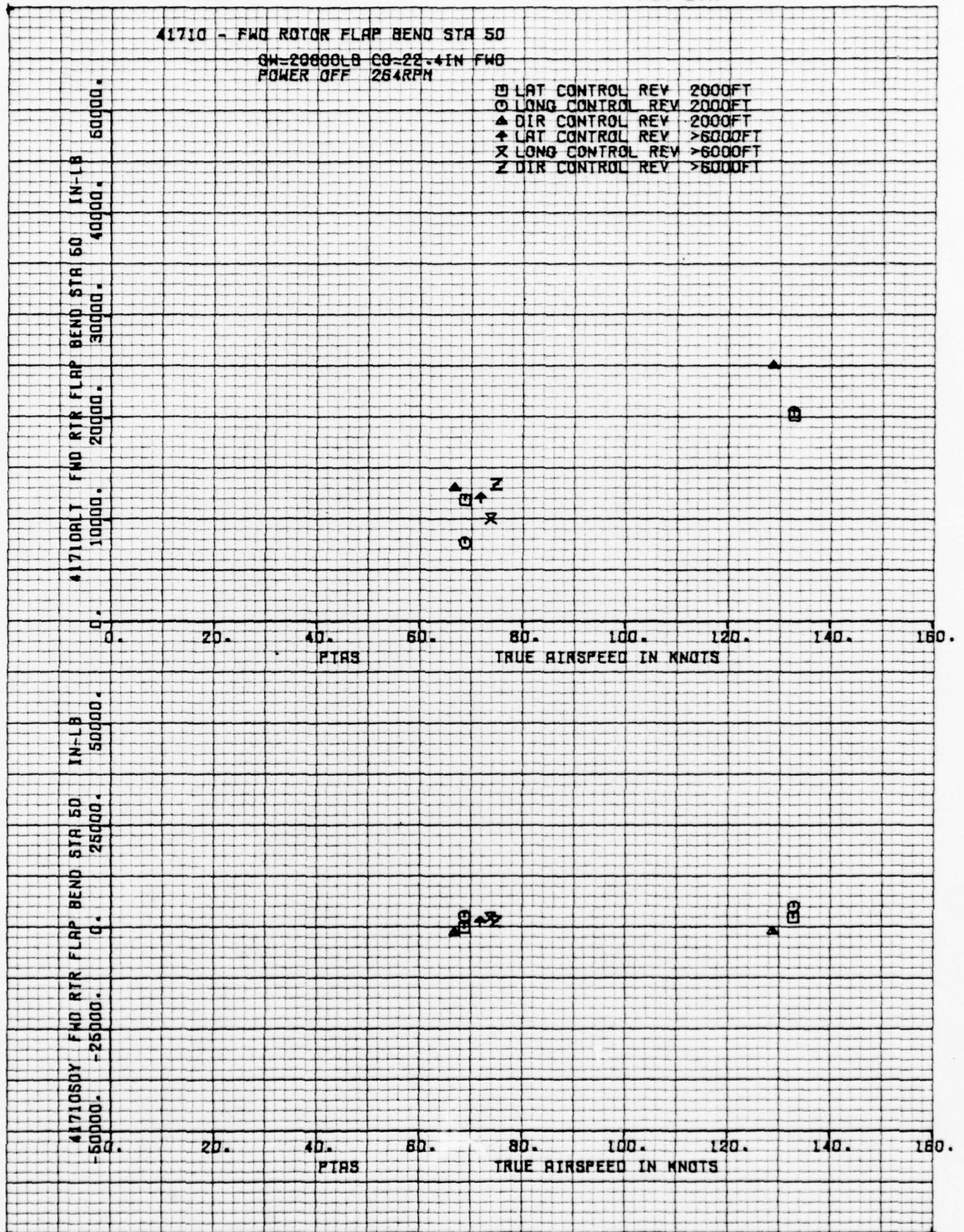
GW=20800LB CG=22.4IN FWD
POWER ON 264RPM

□ LAT CONTROL REV 2000FT
 ○ LONG CONTROL REV 2000FT
 ▲ DIR CONTROL REV 2000FT
 + LAT CONTROL REV 6000FT
 × LONG CONTROL REV 6000FT
 ◇ DIR CONTROL REV 6000FT
 ◆ LAT CONTROL REV >6000FT
 λ LONG CONTROL REV >6000FT
 Z DIR CONTROL REV >6000FT

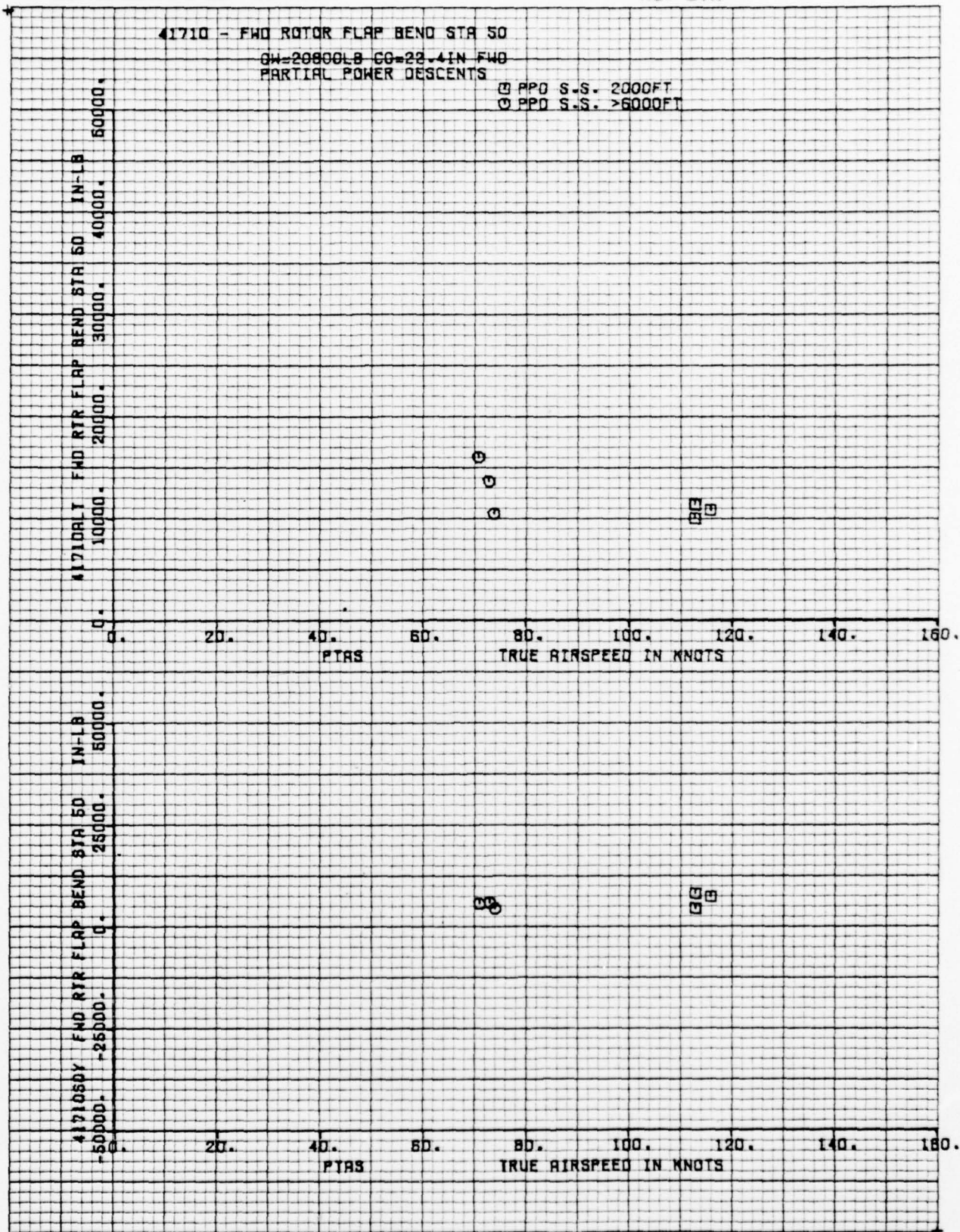


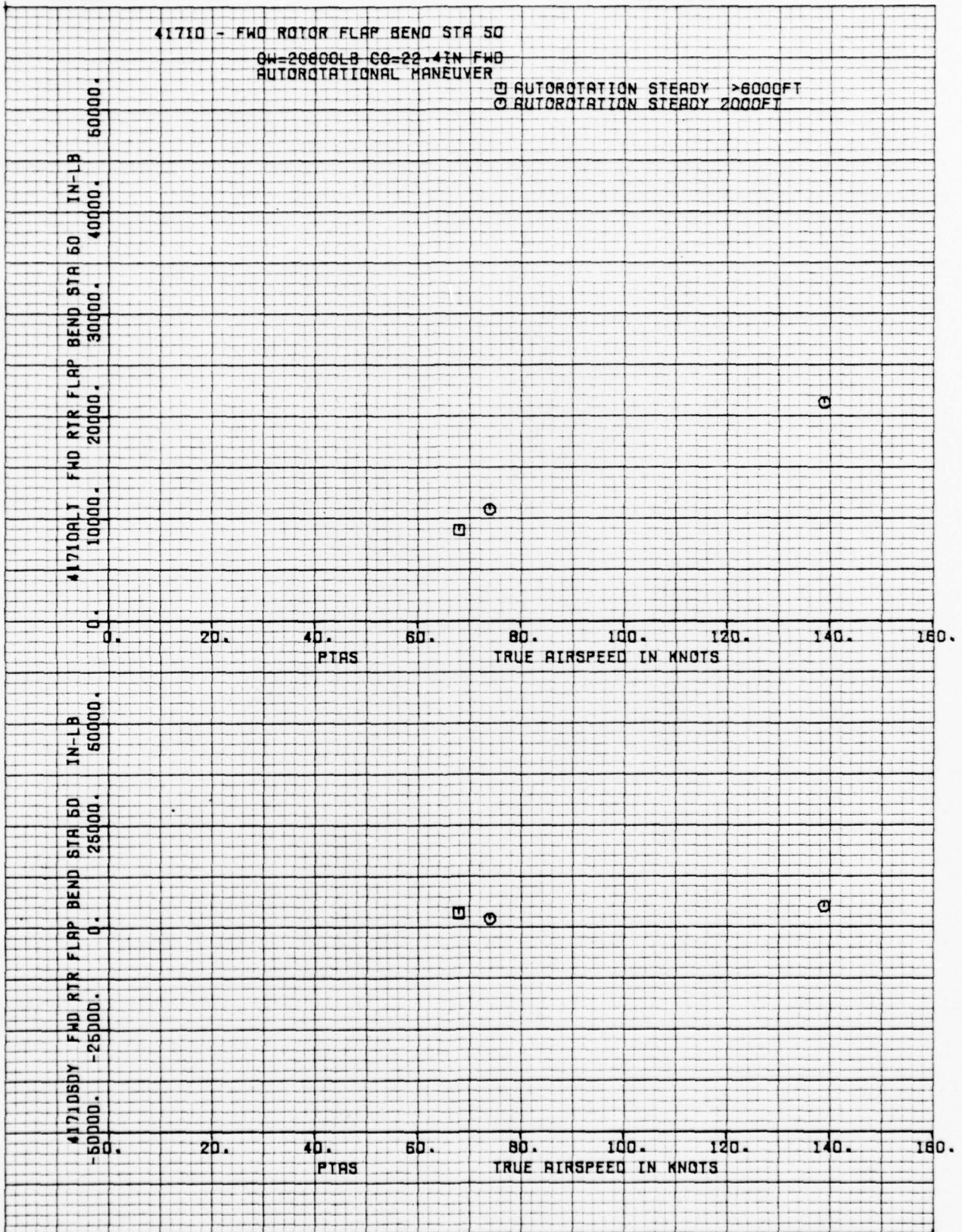
THE **BOEING** COMPANY



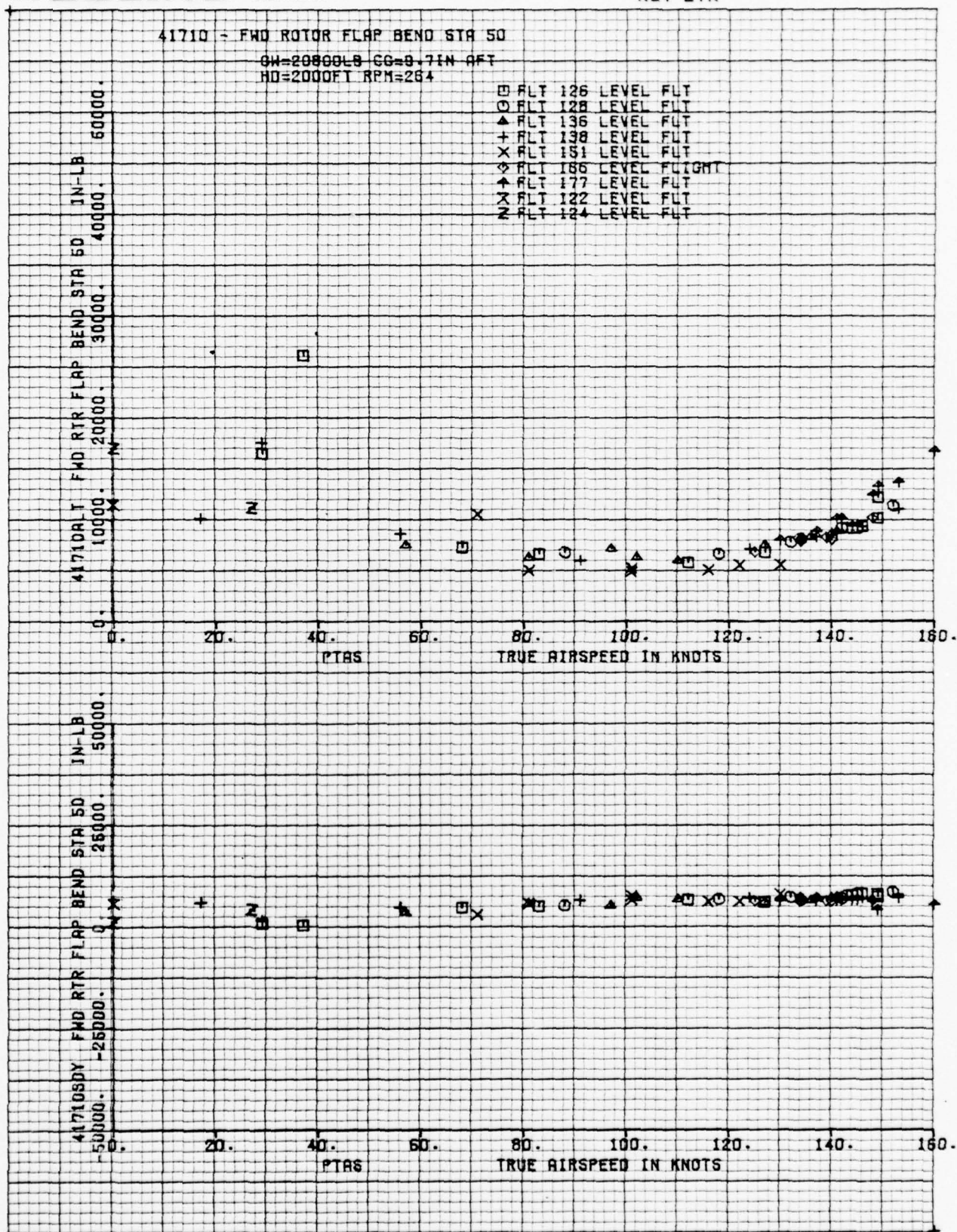
THE **BOEING** COMPANY

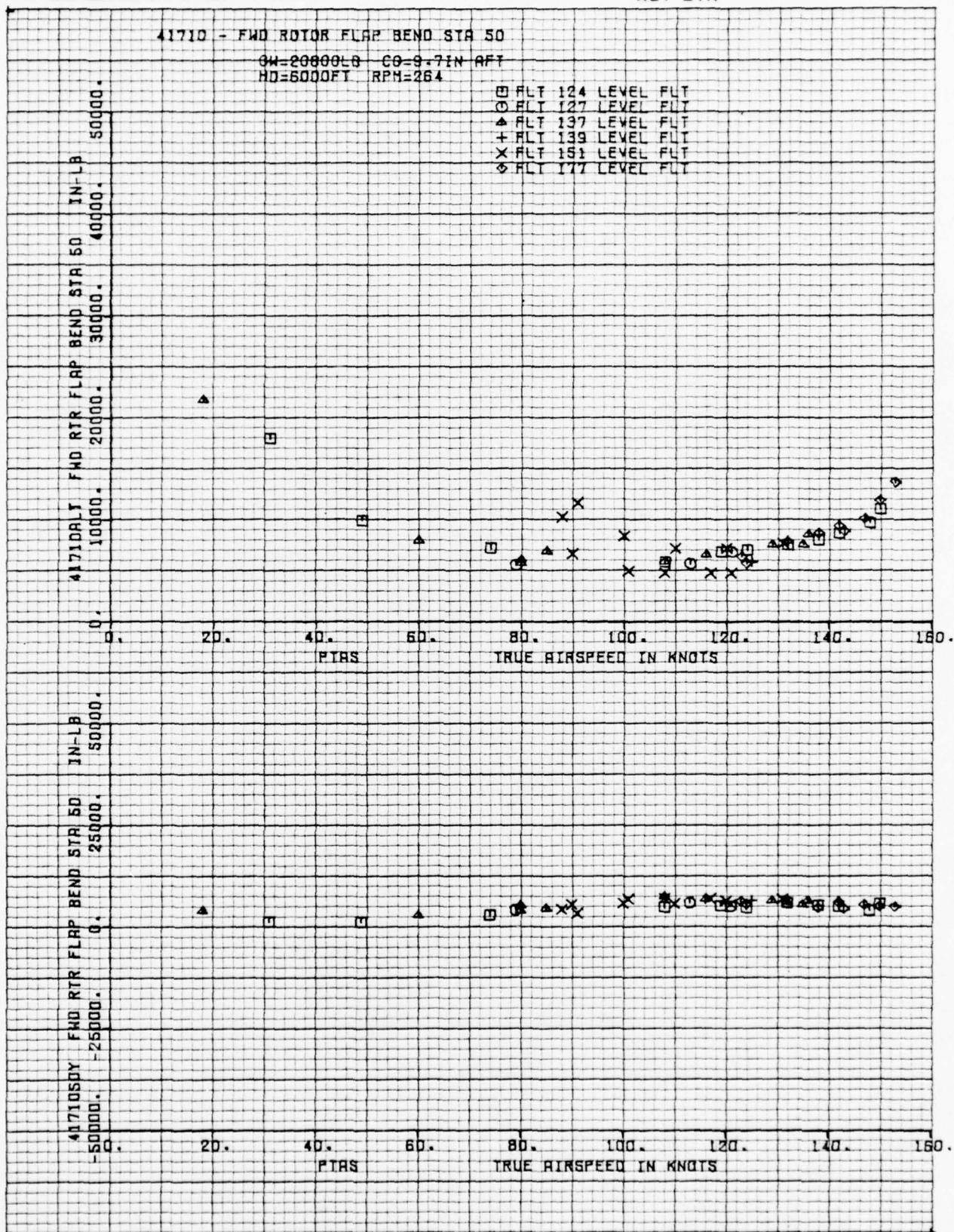
FORM 52300 (10/71)

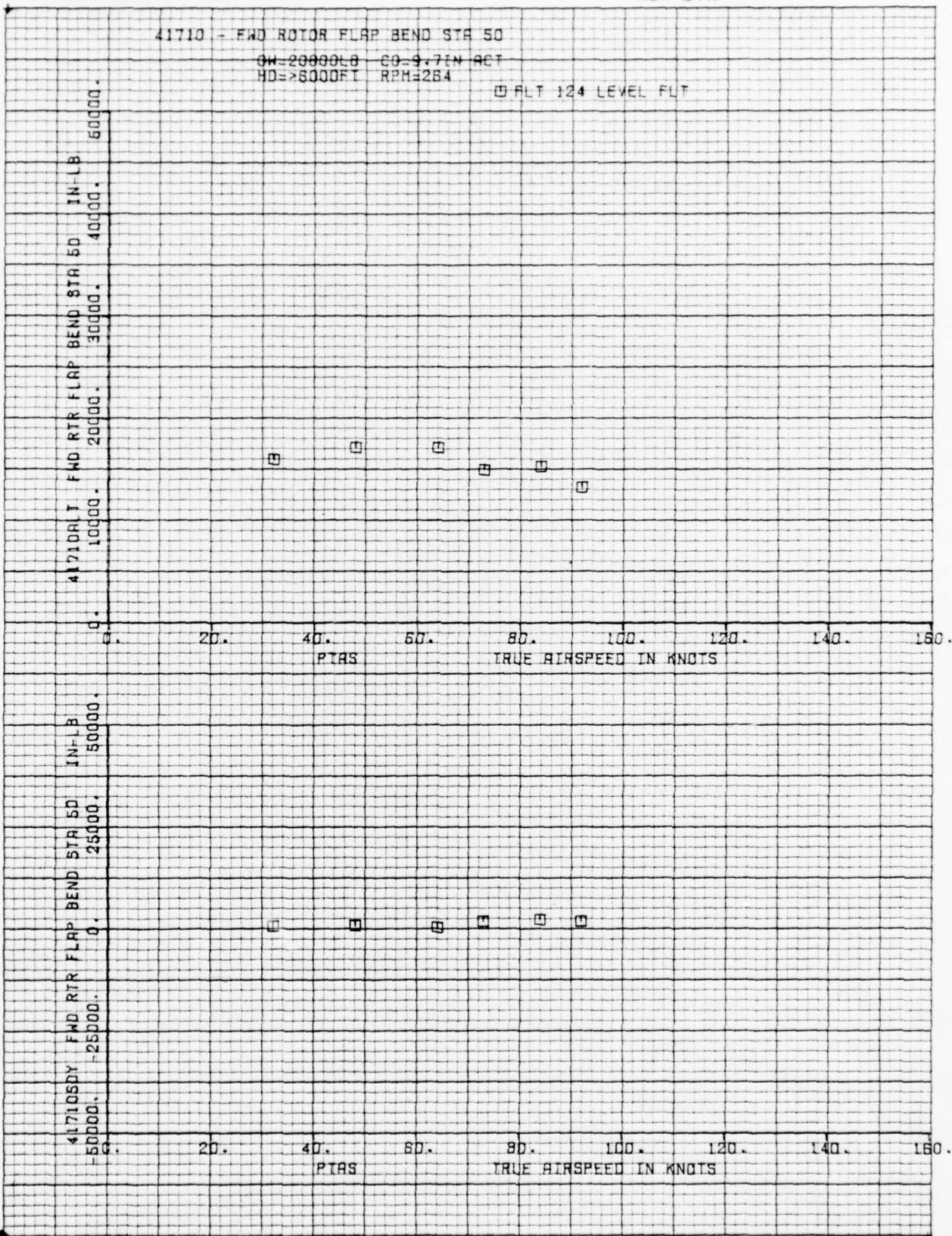


THE **BOEING** COMPANY

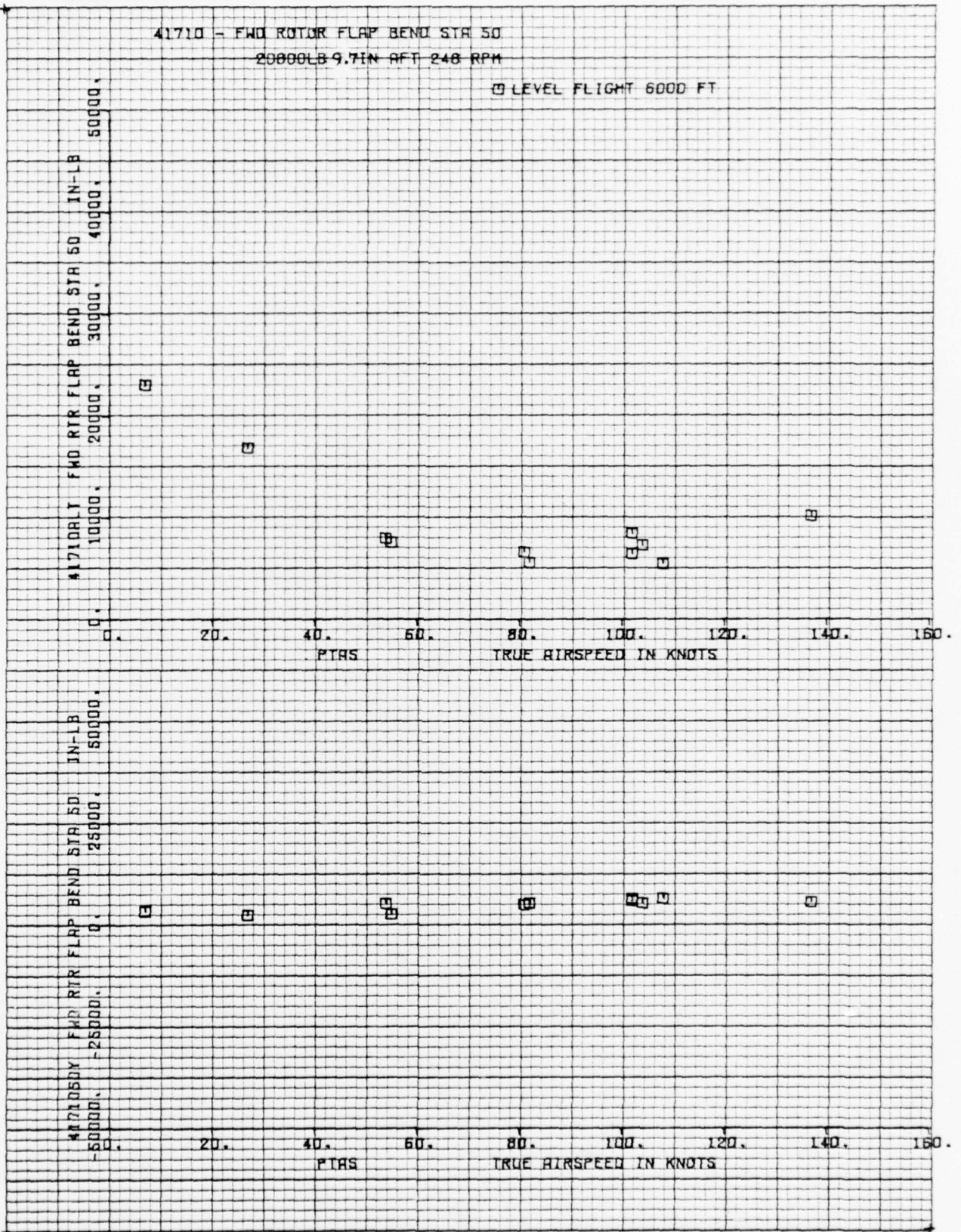
FORM 52300 (10/71)







THE **BOEING** COMPANY



THE **BOEING** COMPANY

41710 - FWD ROTOR FLAP BEND STA 50

GW=20000LB CG=9.7IN AFT 264RDM
PULLUPS-POWER ON & OFF

- LNG PULLUP PWR ON 2000FT
- CP PULLUP PWR ON 2000FT
- △ LNG PULLUP PWR ON 6000FT
- + CP PULLUP PWR ON 6000FT
- × LNG PULLUP PWR ON >6000FT
- ◇ CP PULLUP PWR ON >6000FT
- ♣ LNG PULLUP PWR OFF ANY HD
- × CP PULLUP PWR OFF ANY ALT
- Z PRD RECOVERY ANY ALT

41710ALT FWD RTR FLAP BEND STA 50 IN-LB

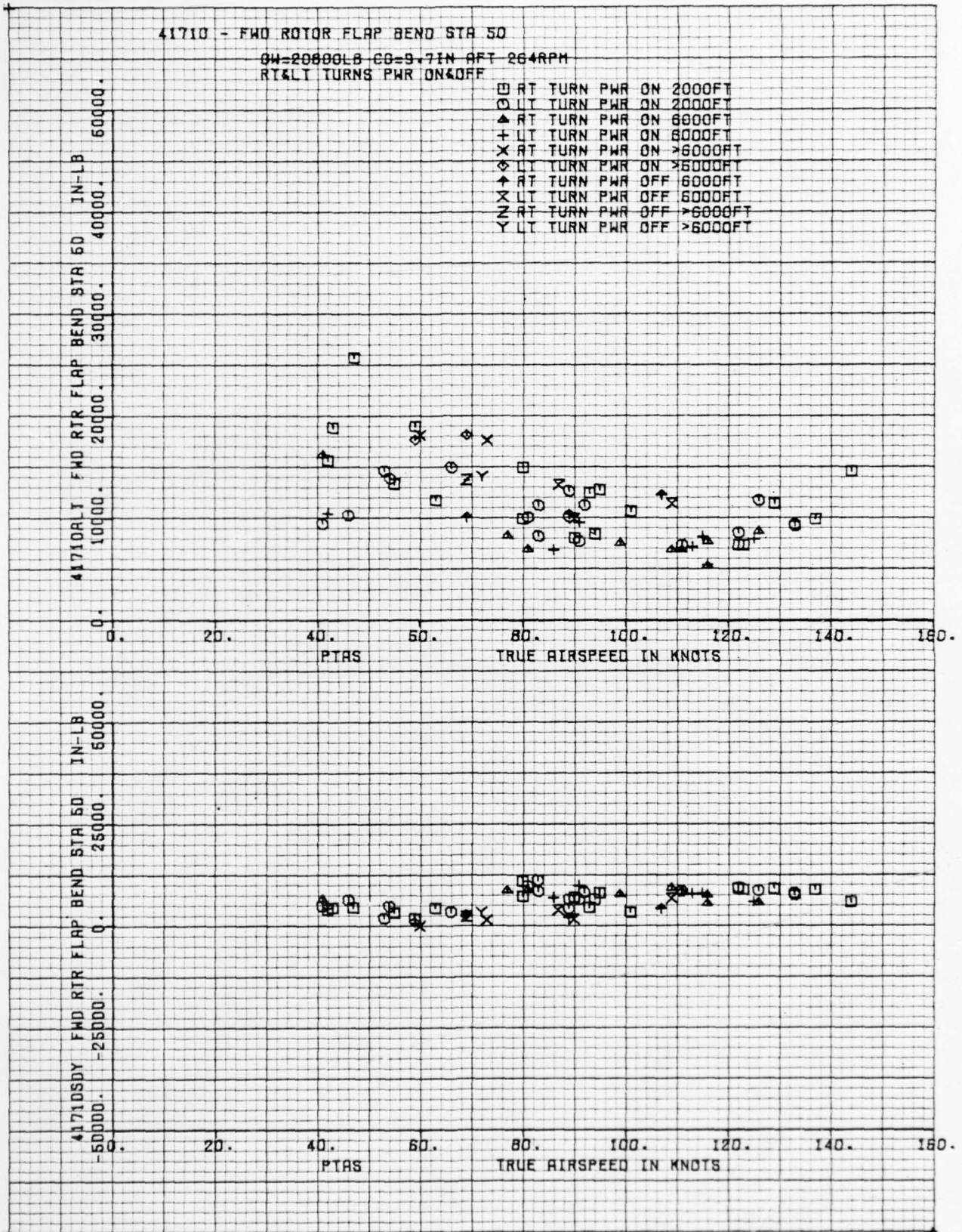
417106DY FWD RTR FLAP BEND STA 50 IN-LB

PTAS

TRUE AIRSPEED IN KNOTS

TAS

TRUE AIRSPEED IN KNOTS

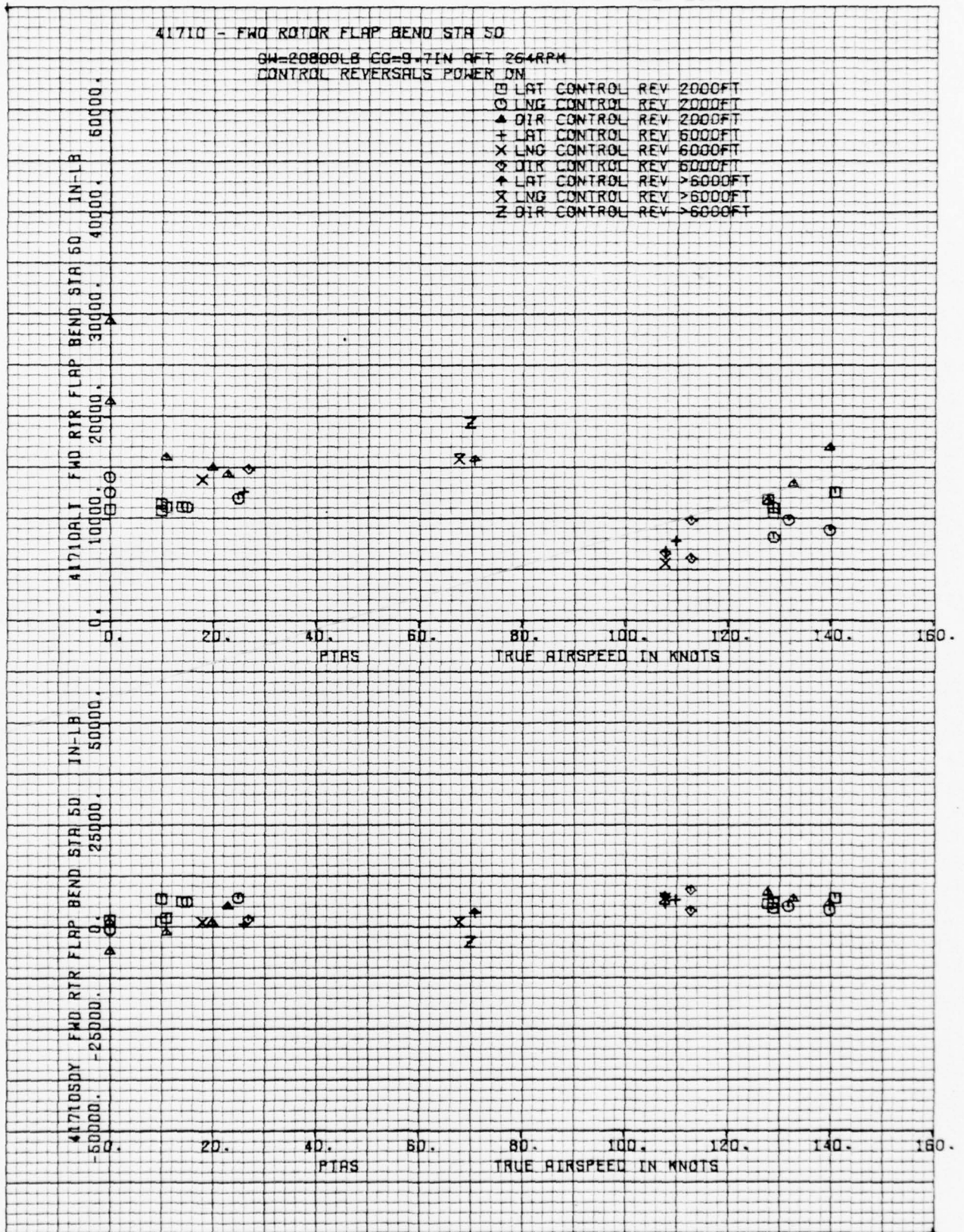
THE **BOEING** COMPANY

THE **BOEING** COMPANY

41710 - FWD ROTOR FLAP BEND STA 50

GW=20800LB CG=9.7IN AFT 264RPM
CONTROL REVERSALS POWER ON

□ LAT CONTROL REV 2000FT
 ○ LNG CONTROL REV 2000FT
 ▲ DIR CONTROL REV 2000FT
 + LAT CONTROL REV 6000FT
 X LNG CONTROL REV 6000FT
 ◆ DIR CONTROL REV 6000FT
 ↑ LAT CONTROL REV >6000FT
 X LNG CONTROL REV >6000FT
 Z DIR CONTROL REV >6000FT



FORM 52300 (10/71)

41710 - FWD ROTOR FLAP BEND STA 50
GW=20800LB CG=9.71N AFT 264RPM

41710DALY FWD RTR FLAP BEND STA 50 IN-LB
0. 10000. 20000. 30000. 40000. 50000.

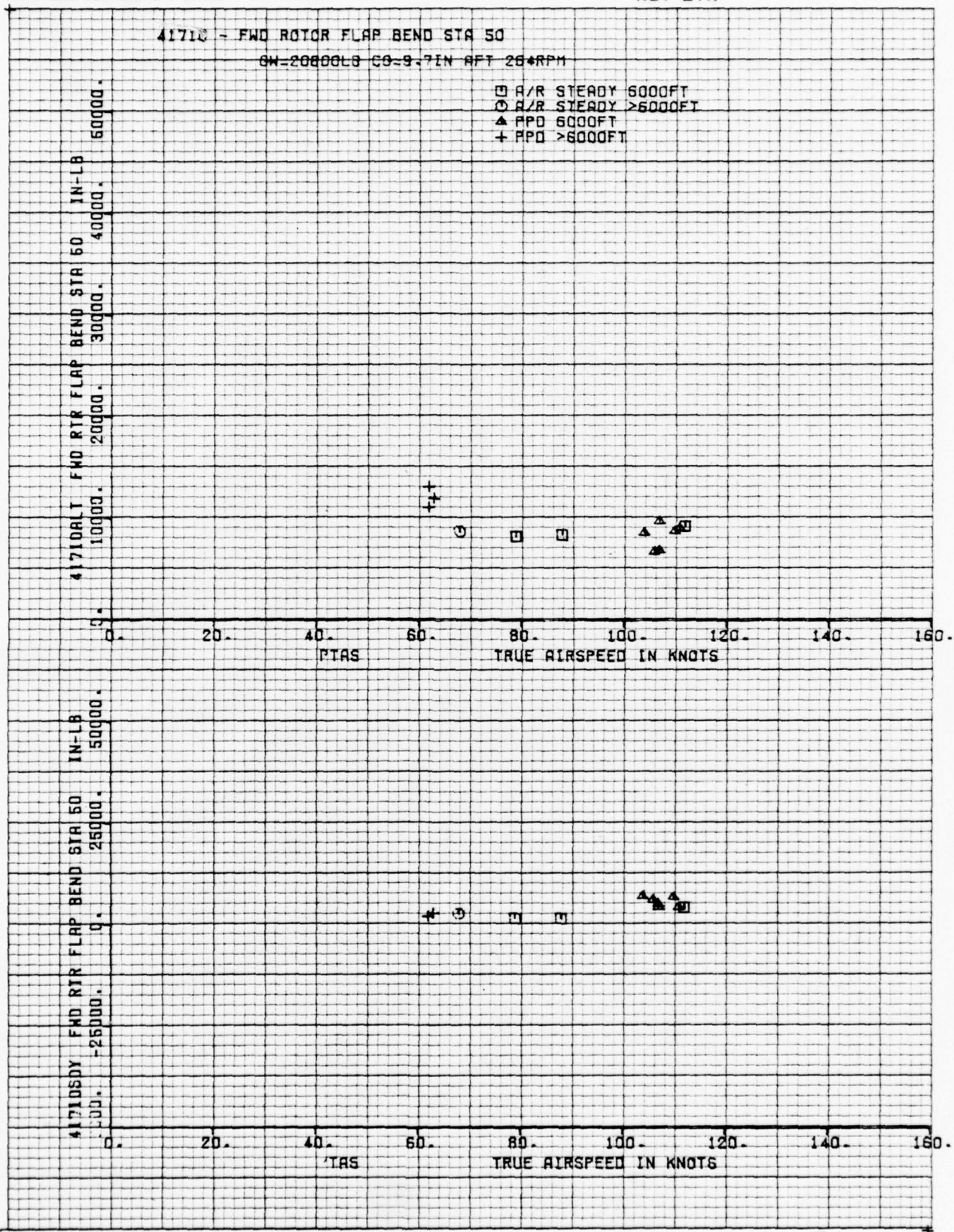
41710SDY FWD RTR FLAP BEND STA 50 IN-LB
-50000. -25000. 0. 25000. 50000.

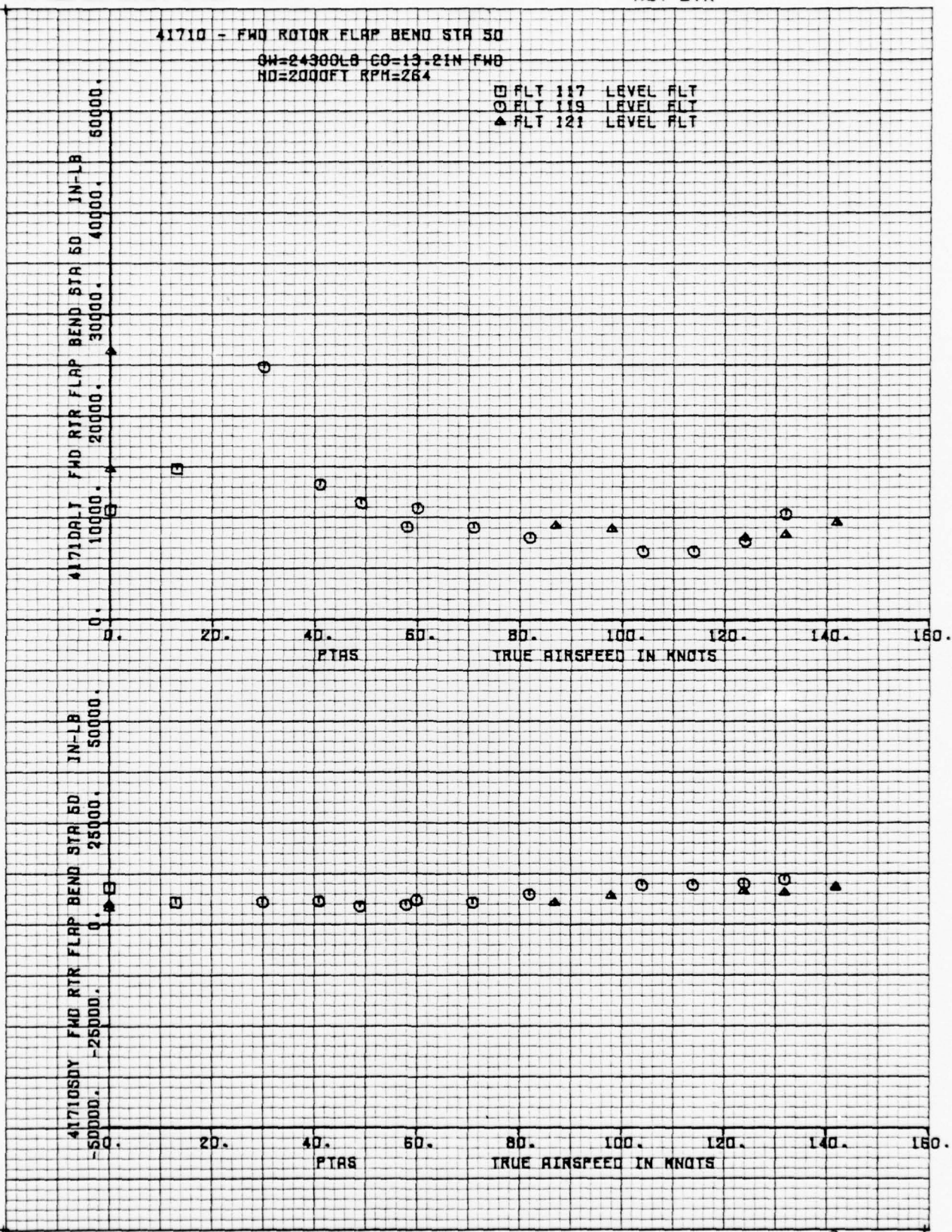
PTAS

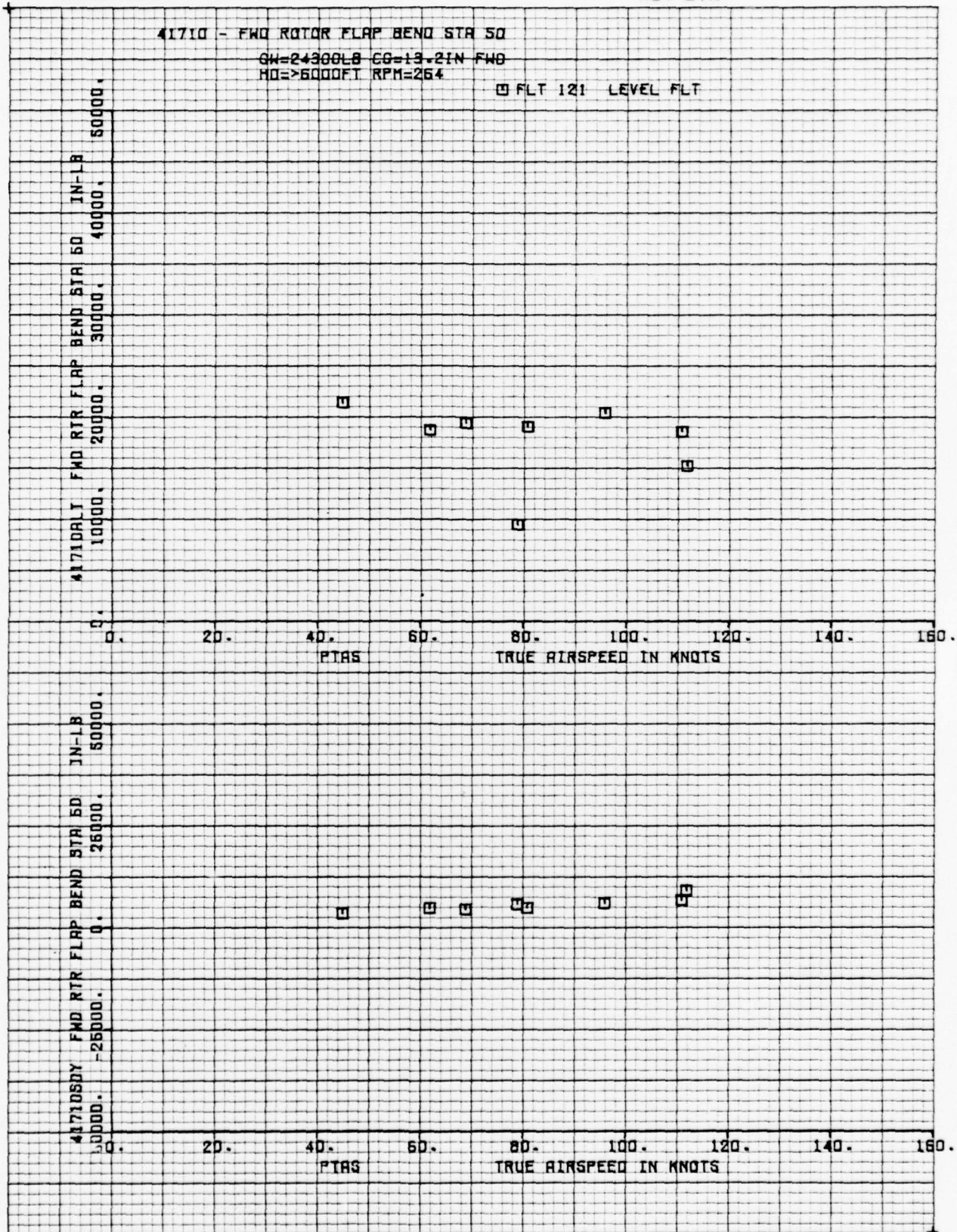
TRUE AIRSPEED IN KNOTS

□ LAT CONTROL REV PWR OFF 6000FT
○ LNG CONTROL REV PWR OFF 6000FT
▲ DIR CONTROL REV PWR OFF 6000FT
+ LAT CONTROL REV PWR OFF >6000FT
× LNG CONTROL REV PWR OFF >6000FT
◇ DIR CONTROL REV PWR OFF >6000FT
↑ SPIRAL DESCENT 6000FT
× FLARE TO HOVER

Configuration	Control Type	Phase	PTAS (Knots)	IN-LB
41710DALY	□	LAT CONTROL REV PWR OFF 6000FT	105	10000
	○	LNG CONTROL REV PWR OFF 6000FT	65	10000
	▲	DIR CONTROL REV PWR OFF 6000FT	60	15000
	+	LAT CONTROL REV PWR OFF >6000FT	75	15000
	×	LNG CONTROL REV PWR OFF >6000FT	75	15000
	◇	DIR CONTROL REV PWR OFF >6000FT	75	20000
	↑	SPIRAL DESCENT 6000FT	75	15000
	↑	SPIRAL DESCENT 6000FT	80	15000
	↑	SPIRAL DESCENT 6000FT	110	10000
	↑	SPIRAL DESCENT 6000FT	115	10000
	↑	SPIRAL DESCENT 6000FT	115	15000
	↑	SPIRAL DESCENT 6000FT	115	20000
	×	FLARE TO HOVER	45	30000
	×	FLARE TO HOVER	55	35000
	×	FLARE TO HOVER	65	40000
41710SDY	□	LAT CONTROL REV PWR OFF 6000FT	105	0
	○	LNG CONTROL REV PWR OFF 6000FT	65	0
	▲	DIR CONTROL REV PWR OFF 6000FT	60	0
	+	LAT CONTROL REV PWR OFF >6000FT	75	0
	×	LNG CONTROL REV PWR OFF >6000FT	75	0
	◇	DIR CONTROL REV PWR OFF >6000FT	75	0
	↑	SPIRAL DESCENT 6000FT	75	0
	↑	SPIRAL DESCENT 6000FT	80	0
	↑	SPIRAL DESCENT 6000FT	110	0
	↑	SPIRAL DESCENT 6000FT	115	0
	↑	SPIRAL DESCENT 6000FT	115	10000
	↑	SPIRAL DESCENT 6000FT	115	20000
	×	FLARE TO HOVER	45	0
	×	FLARE TO HOVER	55	0
	×	FLARE TO HOVER	65	0





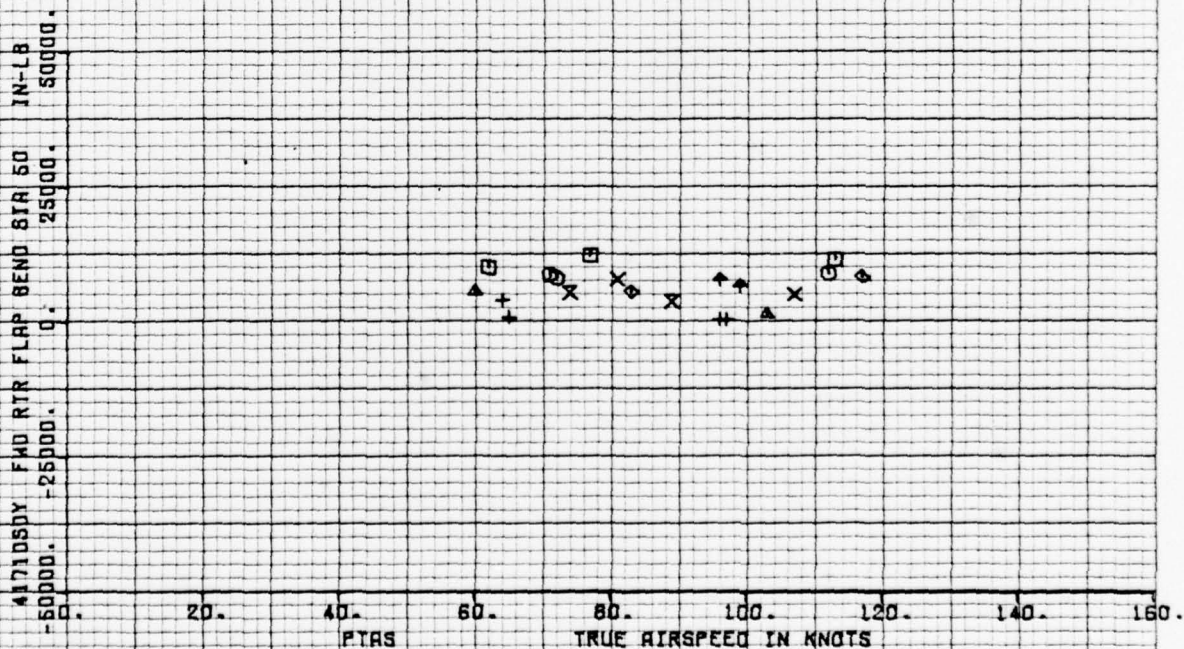
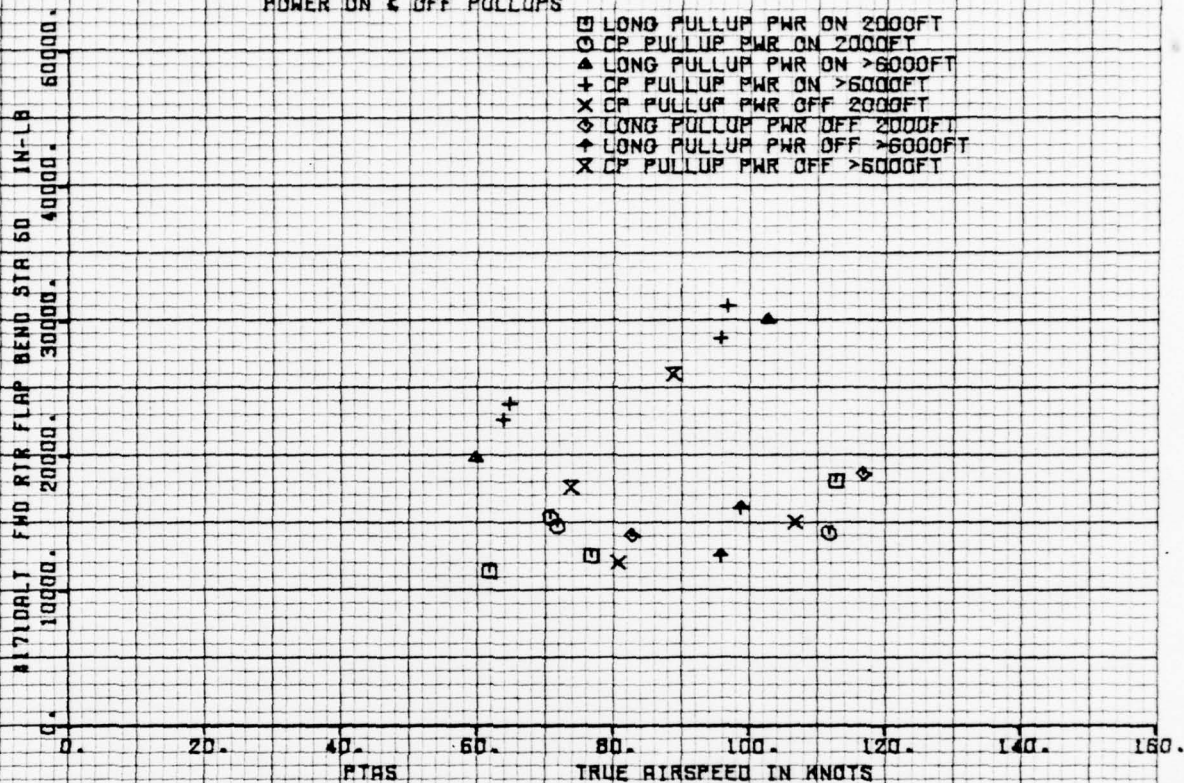
THE **BOEING** COMPANY

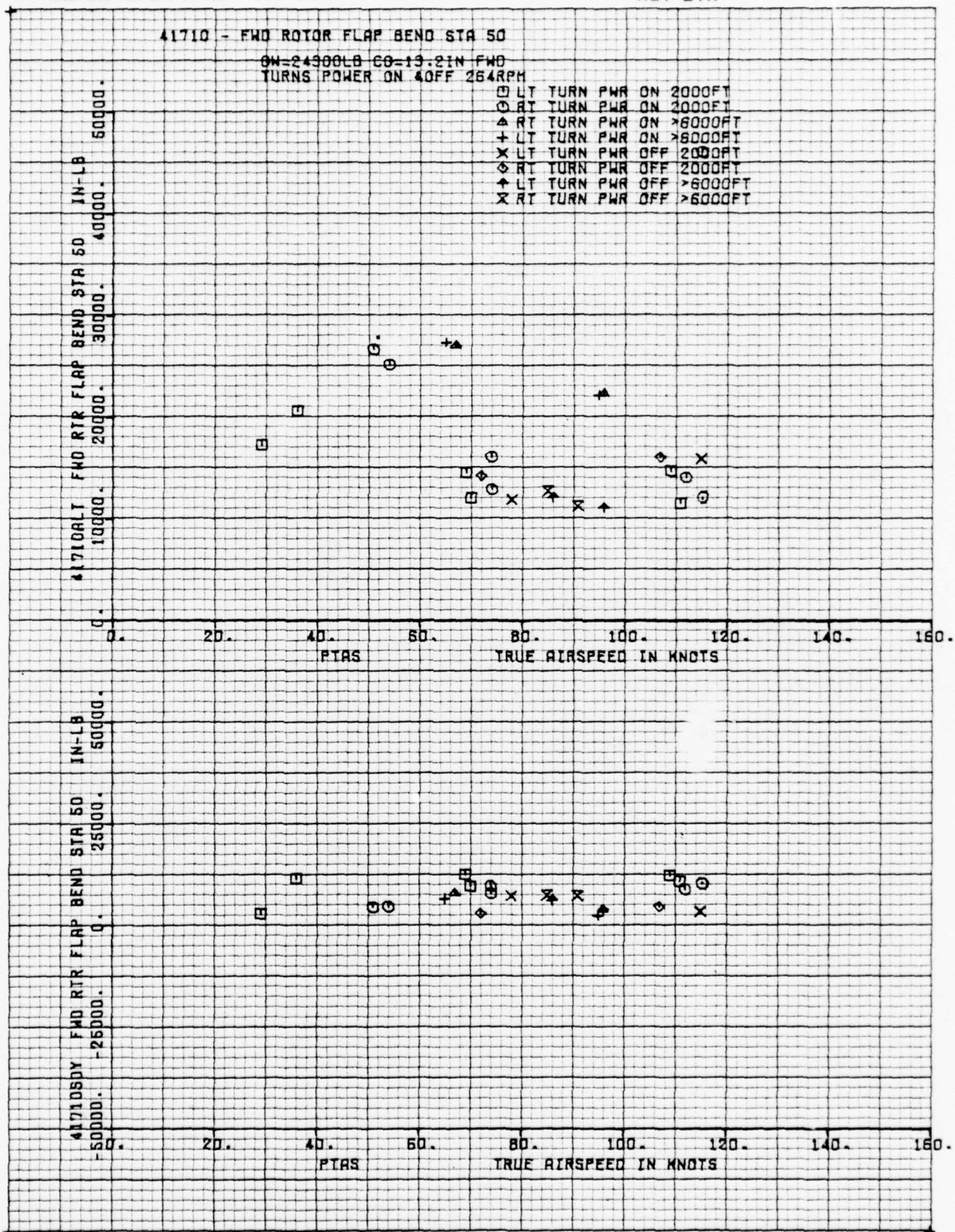
FORM 52300 (10/71)

41710 - FWD ROTOR FLAP BEND STR 50

GW=24300LB CG=13.2IN FWD
POWER ON & OFF PULLUPS

- LONG PULLUP PWR ON 2000FT
- CP PULLUP PWR ON 2000FT
- ▲ LONG PULLUP PWR ON >6000FT
- + CP PULLUP PWR ON >6000FT
- × CP PULLUP PWR OFF 2000FT
- ◇ LONG PULLUP PWR OFF 2000FT
- ↑ LONG PULLUP PWR OFF >6000FT
- × CP PULLUP PWR OFF >6000FT



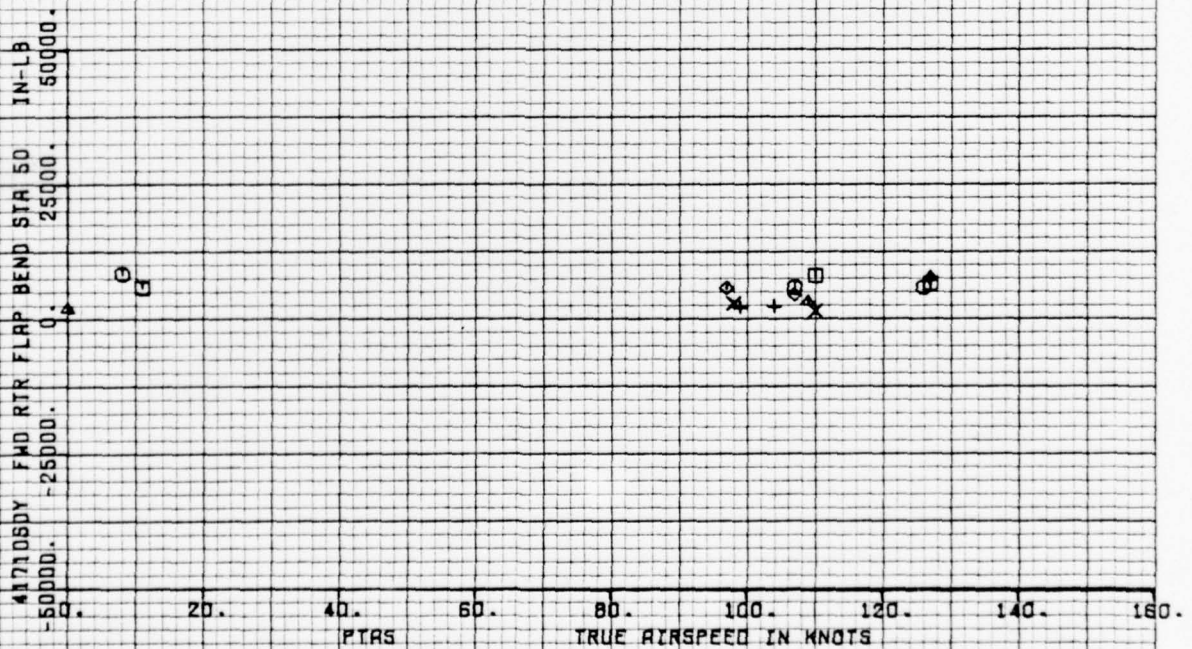
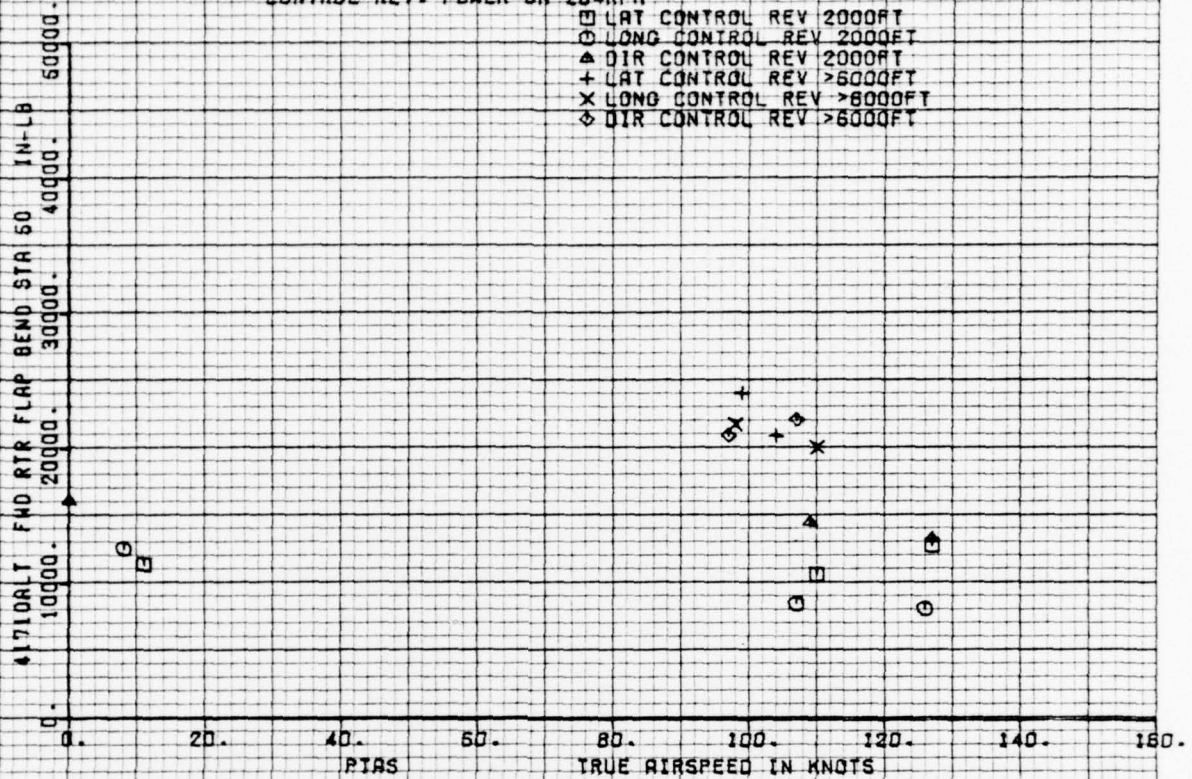


THE **BOEING** COMPANY

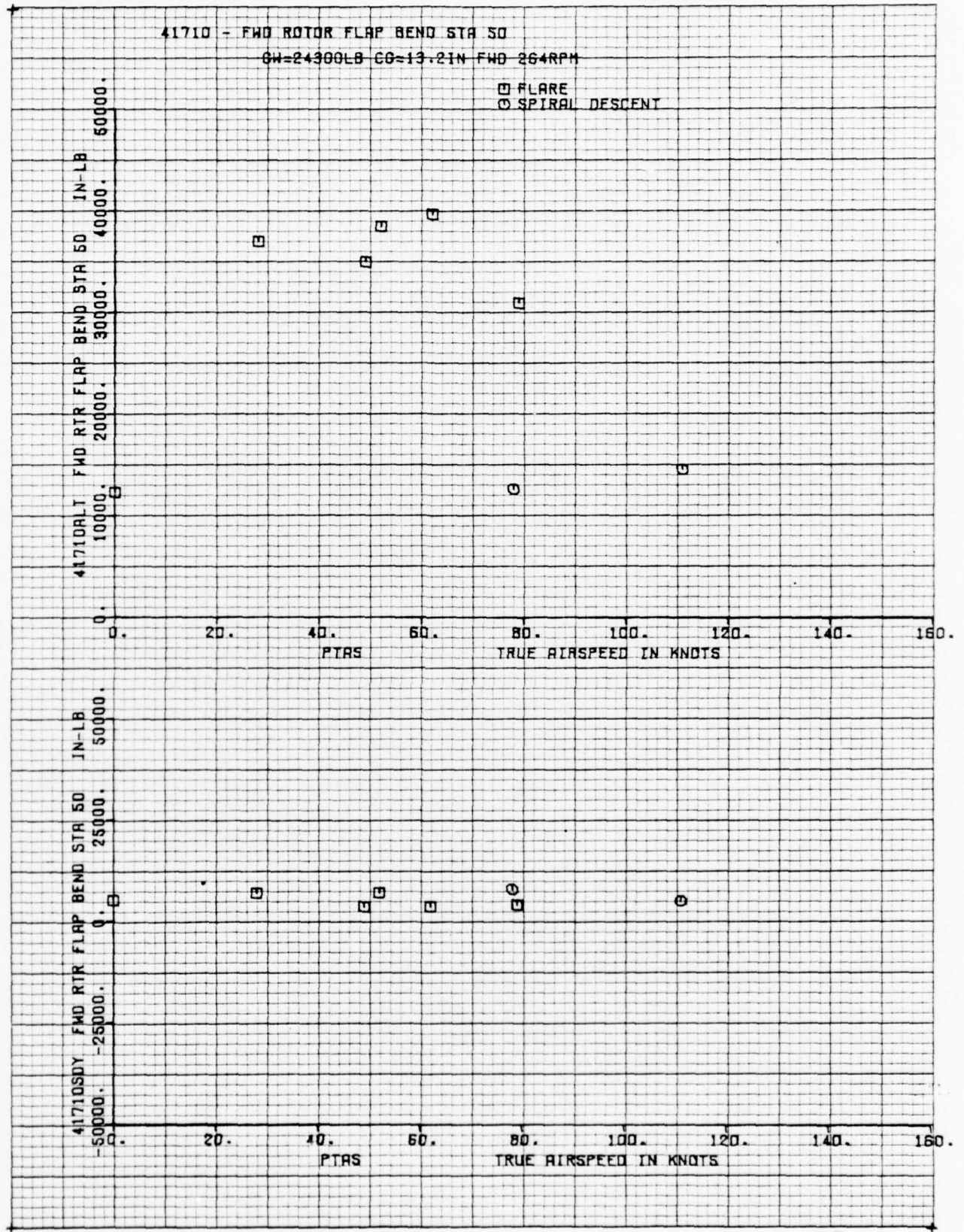
41710 - FWD ROTOR FLAP BEND STA 50

OW-24300LB CO-19.2IN FWD
CONTROL REV. POWER ON 264RPM

- LAT CONTROL REV 2000FT
- LONG CONTROL REV 2000FT
- △ DIR CONTROL REV 2000FT
- + LAT CONTROL REV >6000FT
- x LONG CONTROL REV >6000FT
- ◇ DIR CONTROL REV >6000FT

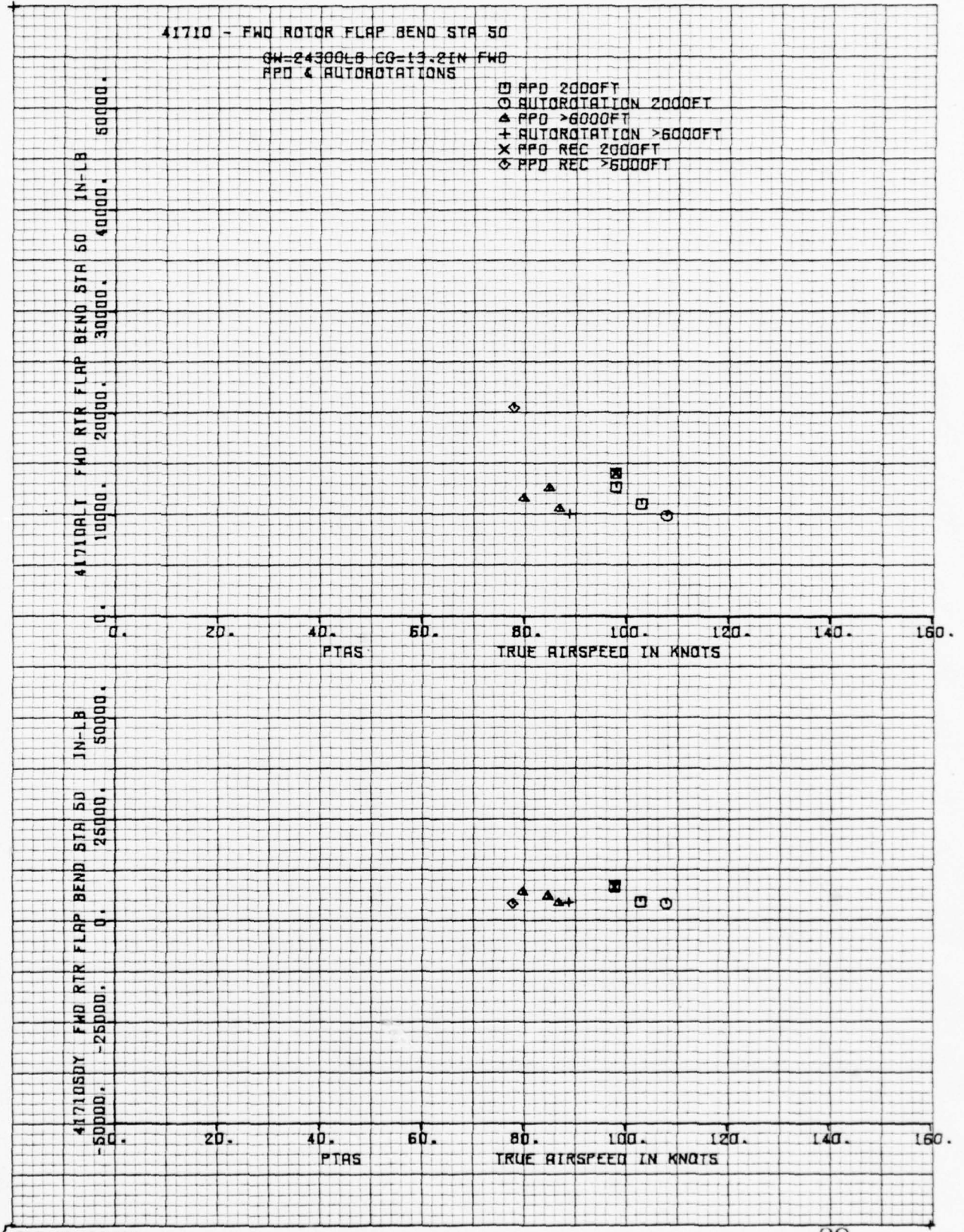


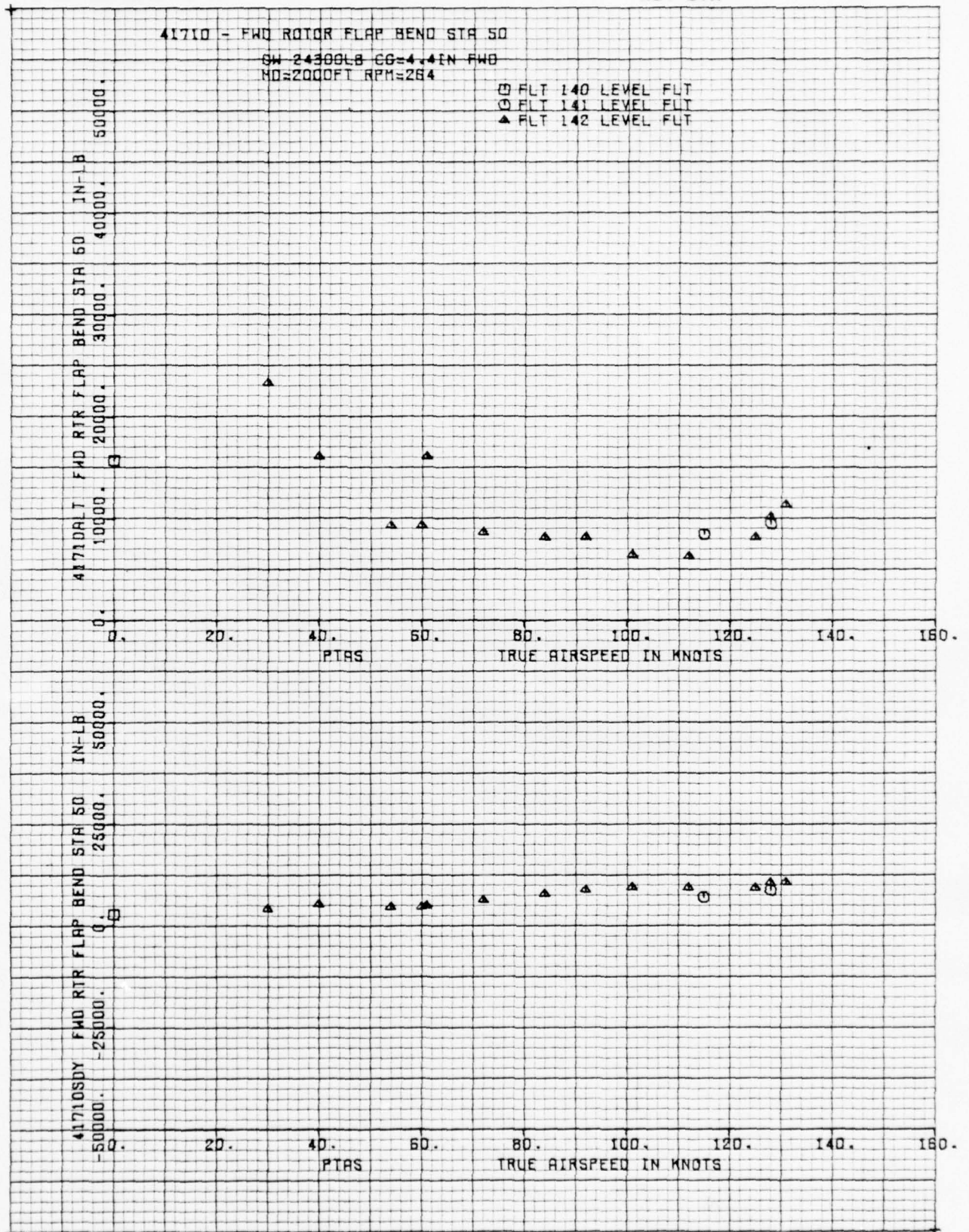
THE **BOEING** COMPANY



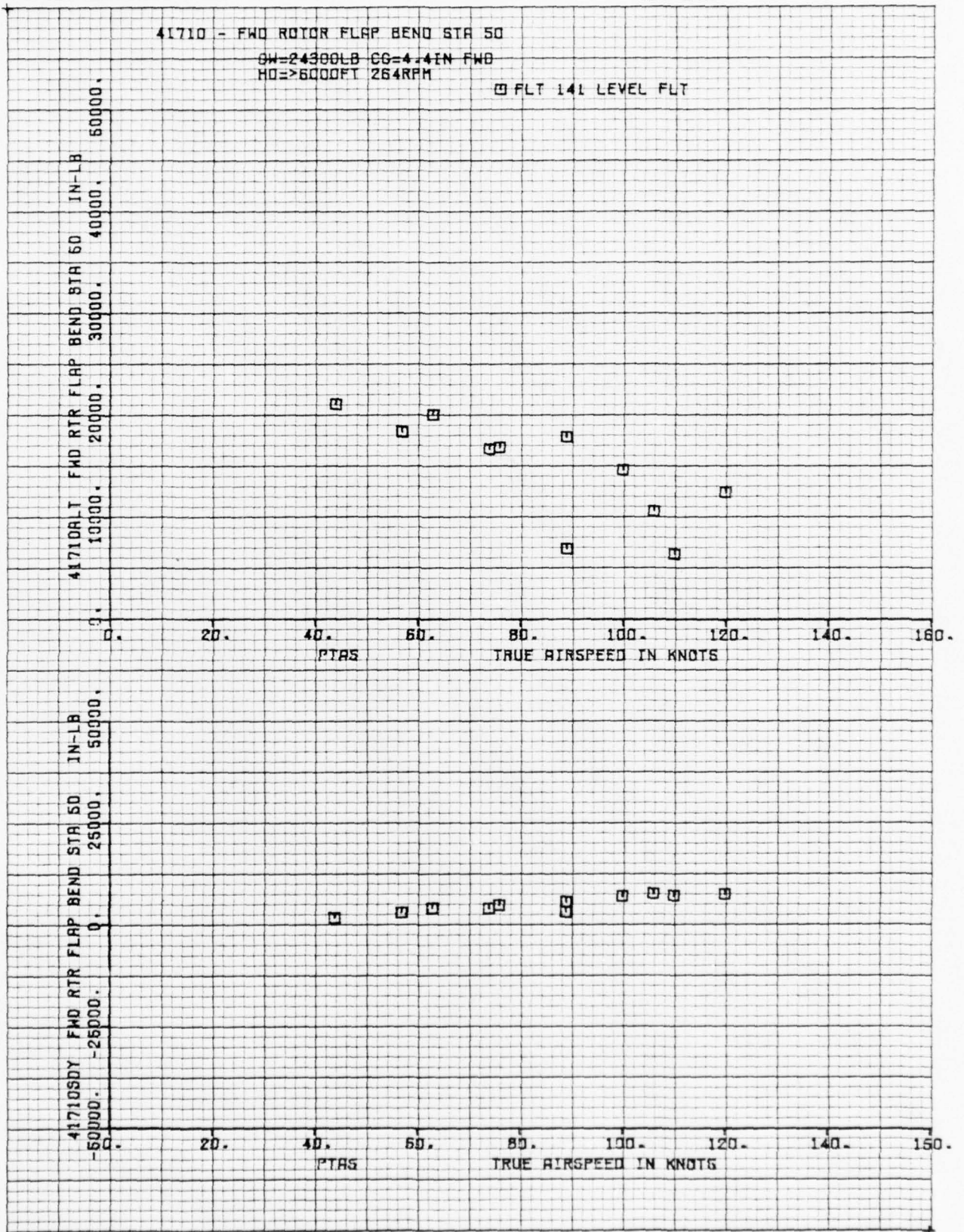
FORM 52300 (10/71)

THE **BOEING** COMPANY



THE **BOEING** COMPANY

FORM 52300 (10/71)

THE **BOEING** COMPANY

FORM 52300 (10/71)

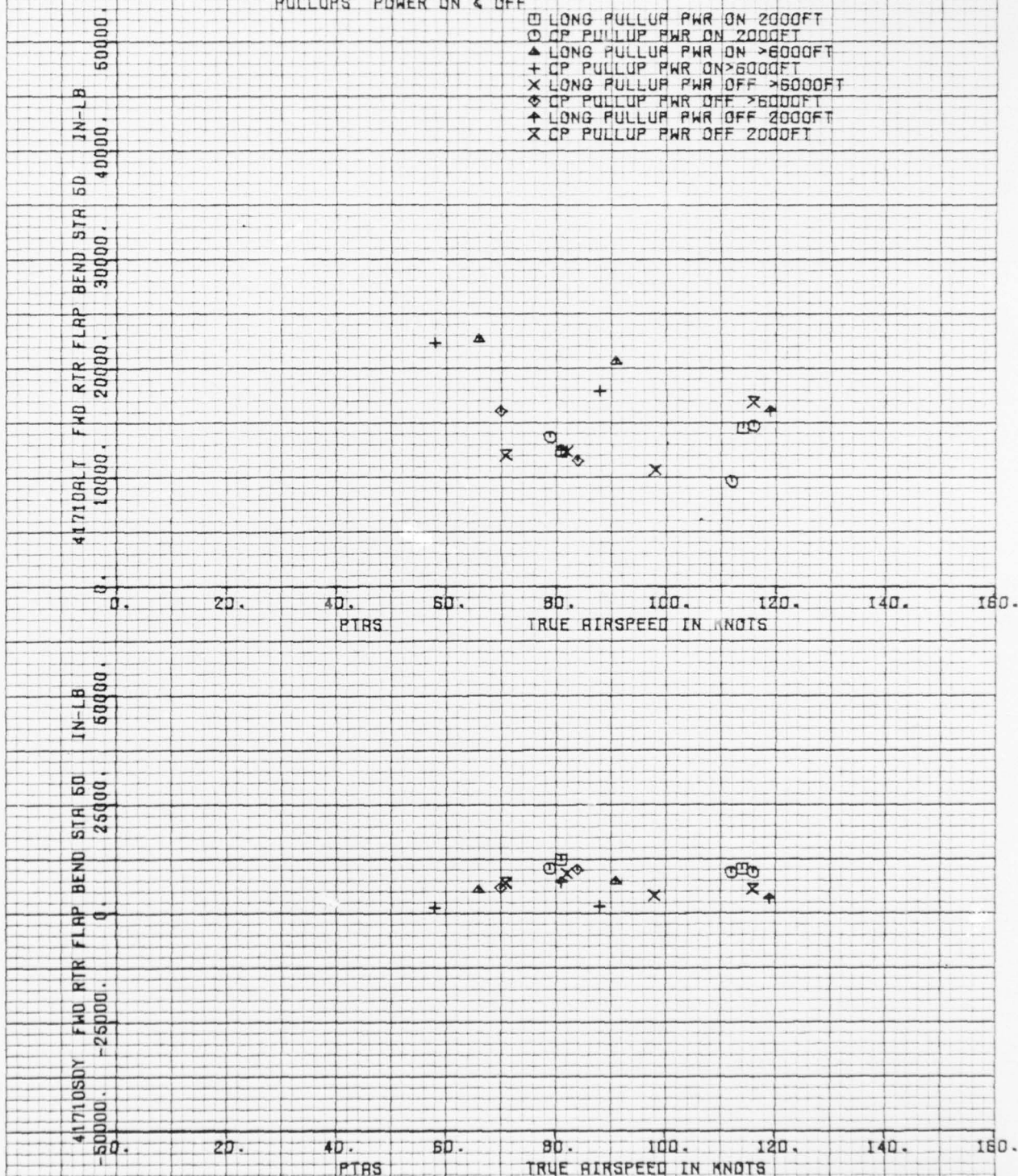
THE **BOEING** COMPANY

41710 - FWD ROTOR FLAP BEND STA 50

GW=243000LB CG=4.4 FWD 264RPM

PULLUPS POWER ON & OFF

- LONG PULLUP PWR ON 2000FT
- CP PULLUP PWR ON 2000FT
- ▲ LONG PULLUP PWR ON >6000FT
- + CP PULLUP PWR ON >6000FT
- × LONG PULLUP PWR OFF >6000FT
- ◇ CP PULLUP PWR OFF >6000FT
- ↑ LONG PULLUP PWR OFF 2000FT
- × CP PULLUP PWR OFF 2000FT



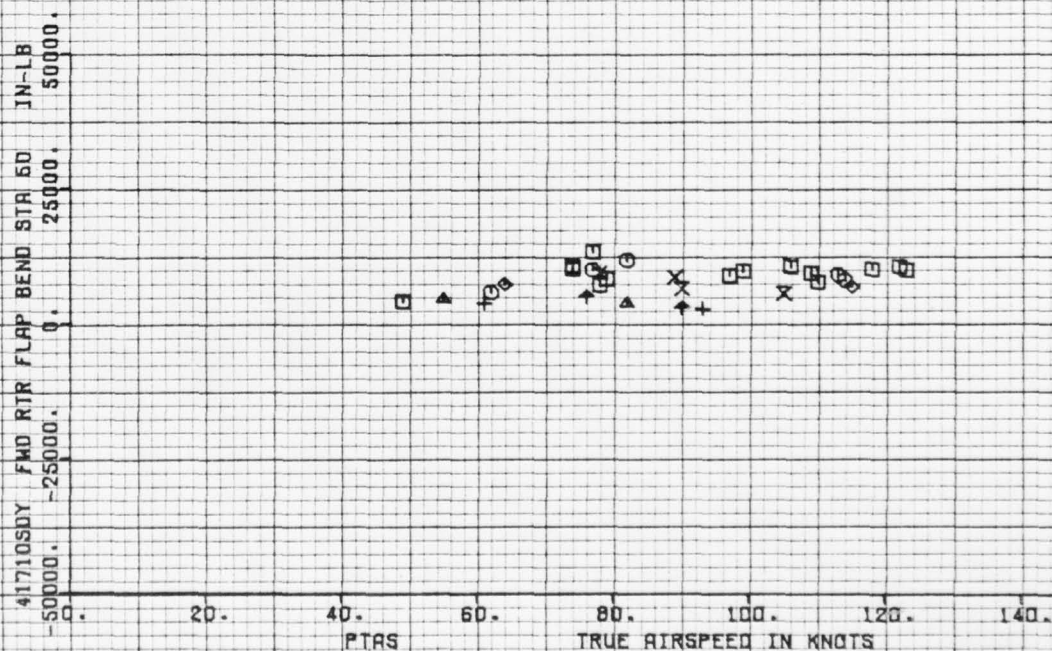
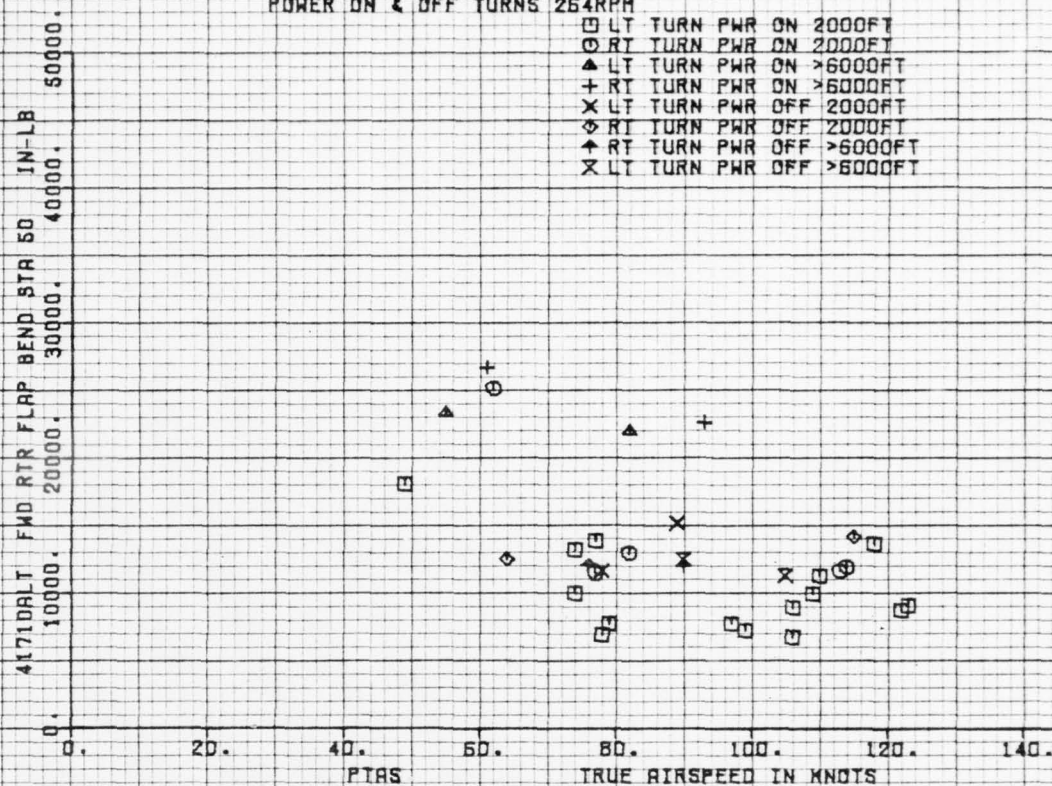
FORM 52300 (10/71)

THE **BOEING** COMPANY

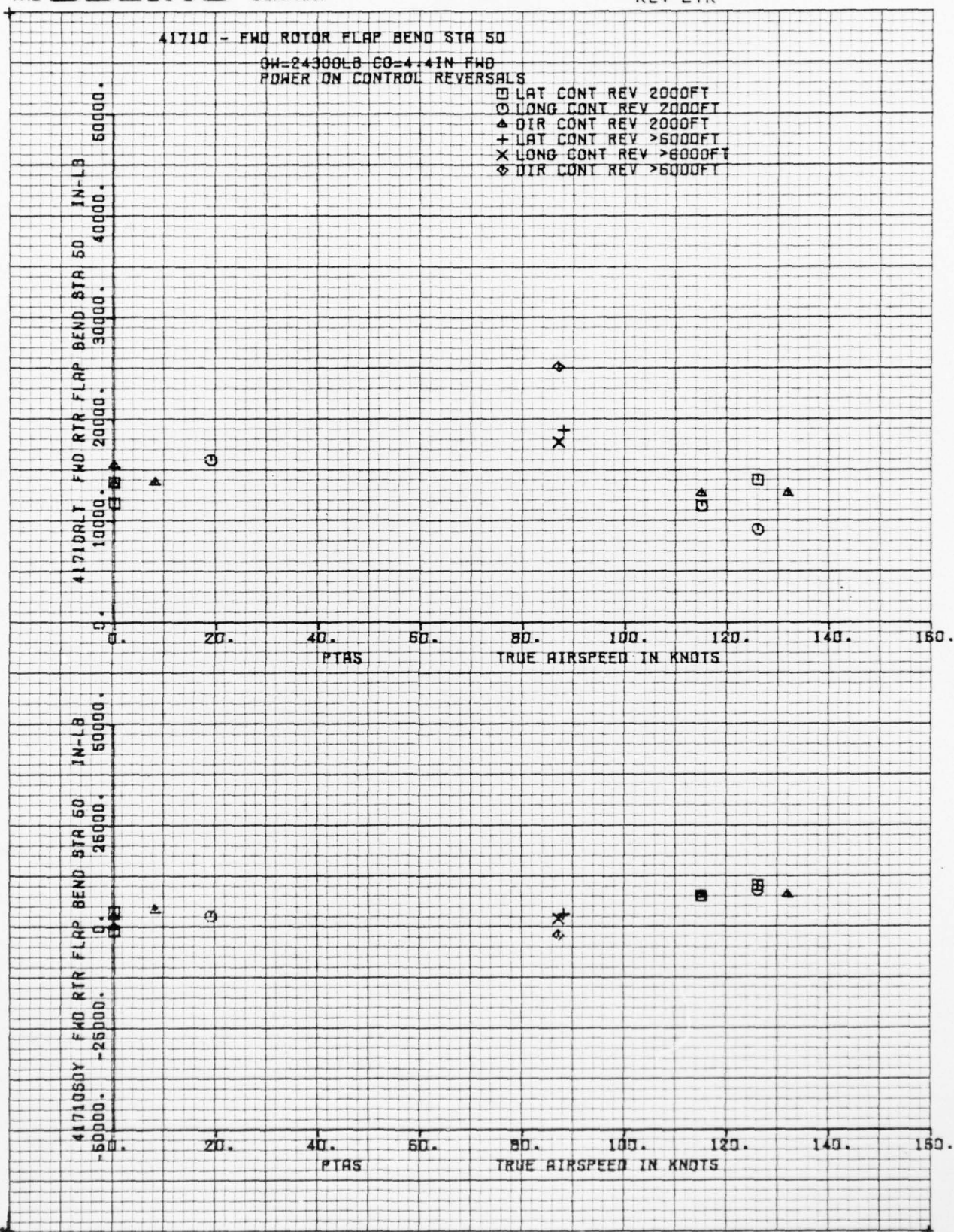
41710 - FWD ROTOR FLAP BEND STA 50

GW=24300LB CO=4.4 FWD
POWER ON & OFF TURNS 254RPM

- LT TURN PWR ON 2000FT
- RT TURN PWR ON 2000FT
- ▲ LT TURN PWR ON >6000FT
- + RT TURN PWR ON >6000FT
- × LT TURN PWR OFF 2000FT
- ◇ RT TURN PWR OFF 2000FT
- ↑ RT TURN PWR OFF >6000FT
- × LT TURN PWR OFF >6000FT

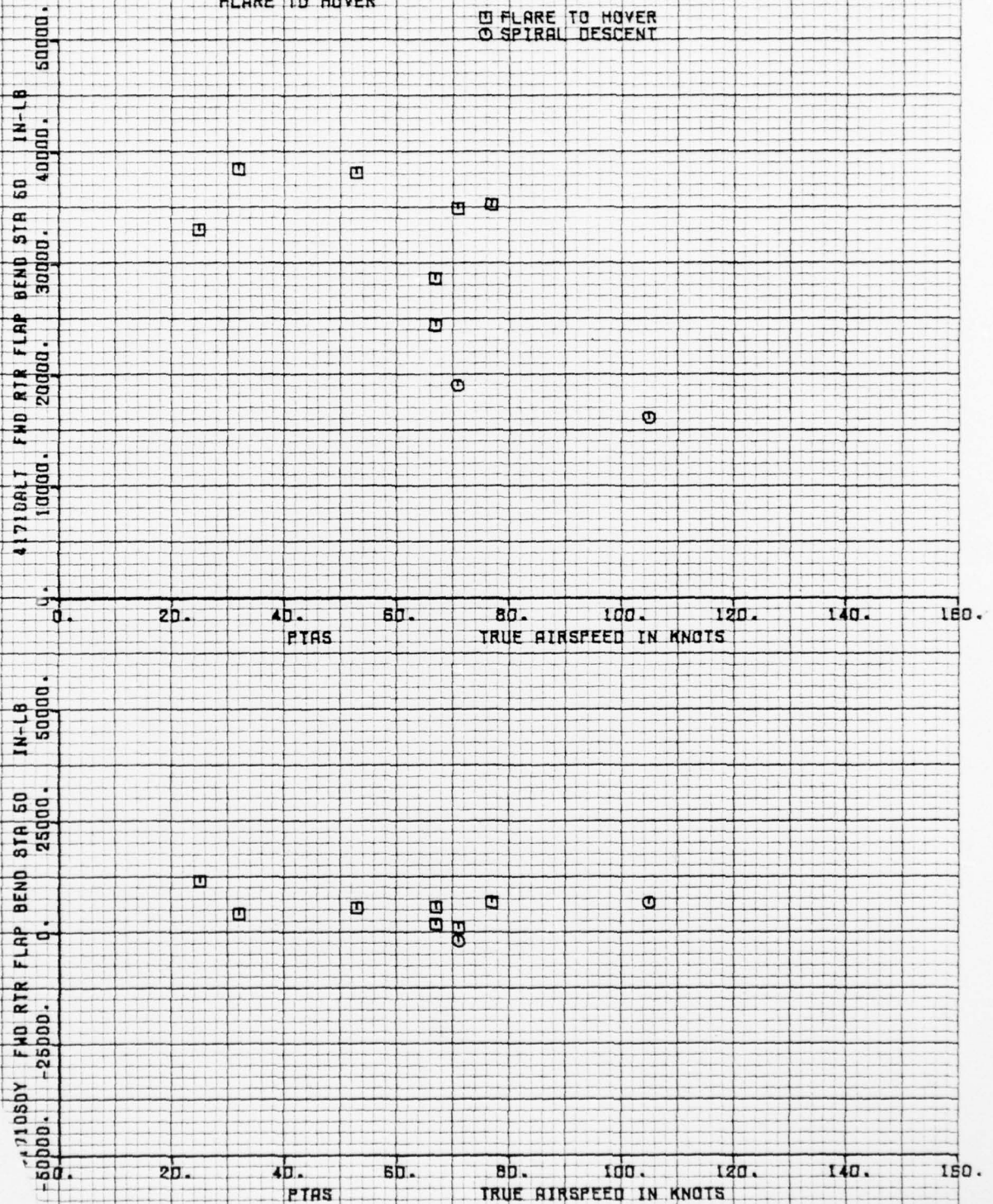


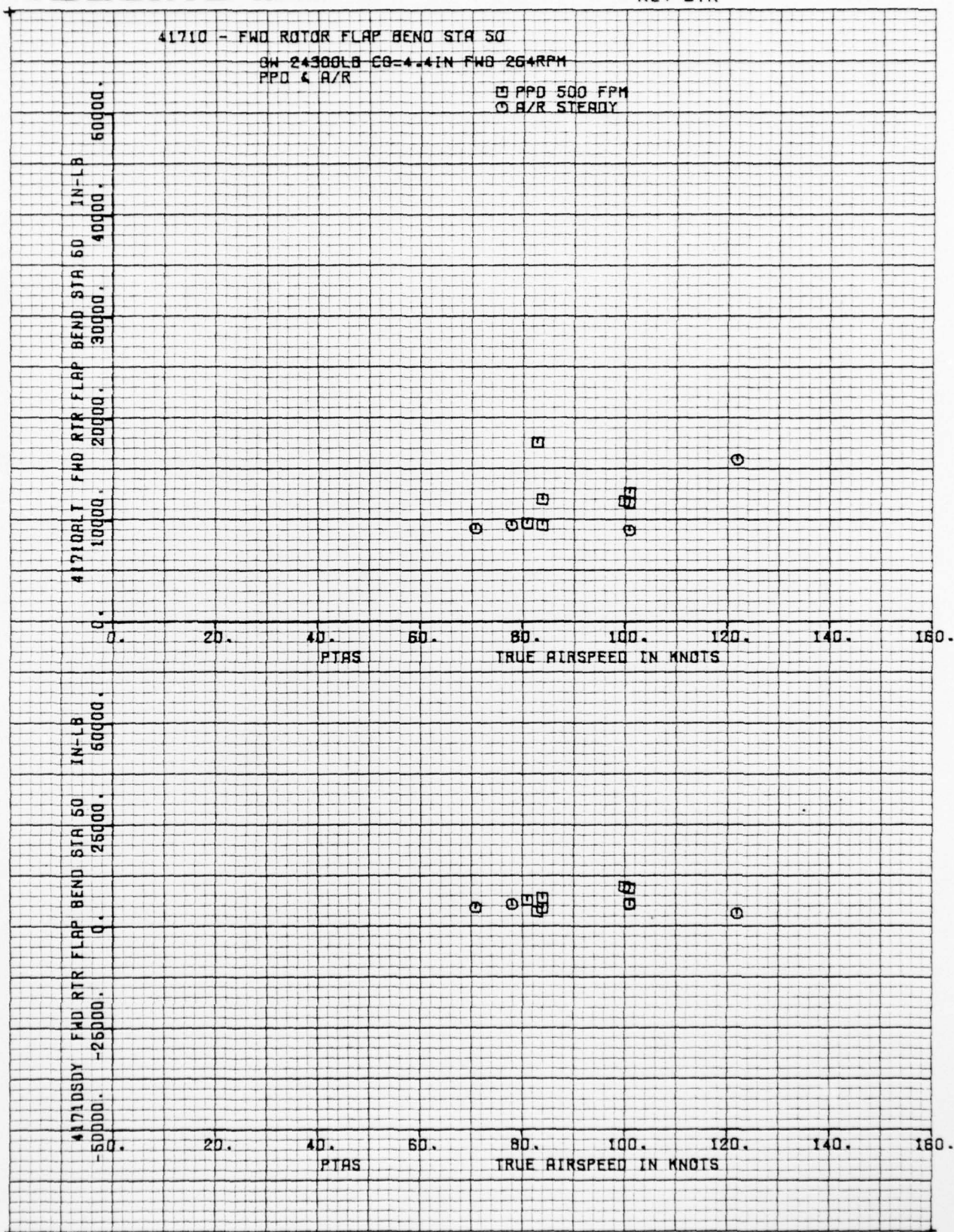
THE **BOEING** COMPANY



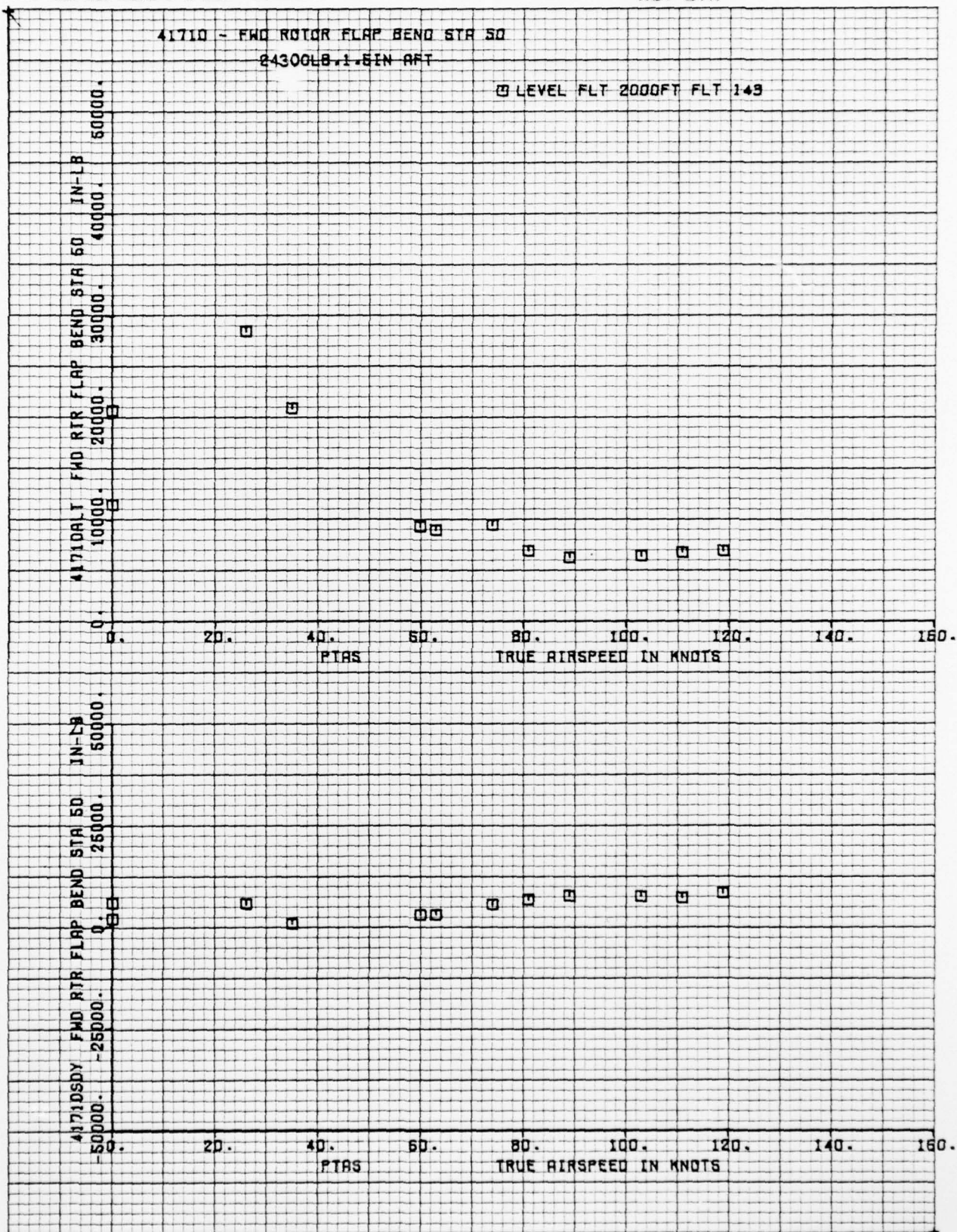
THE **BOEING** COMPANY

41710 - FWD ROTOR FLAP BEND STA 50

OW-24300LB CO-4.4IN FWD 264RPM
FLARE TO HOVER□ FLARE TO HOVER
○ SPIRAL DESCENT

THE **BOEING** COMPANY

FORM 52300 (10/71)



THE **BOEING** COMPANY

PREPARED BY: J. Bendo

CHECKED BY:

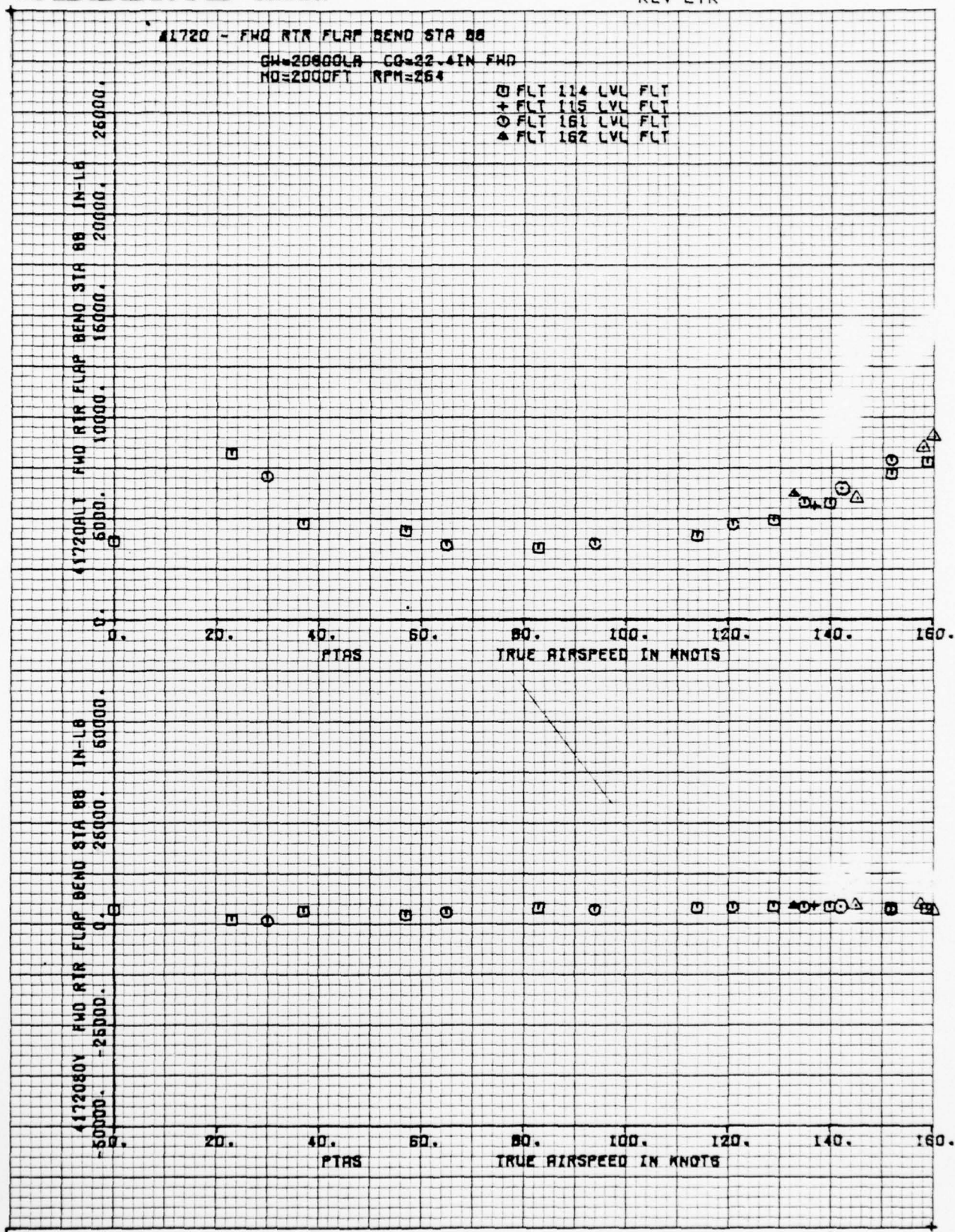
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NUMBER D210-11168-3

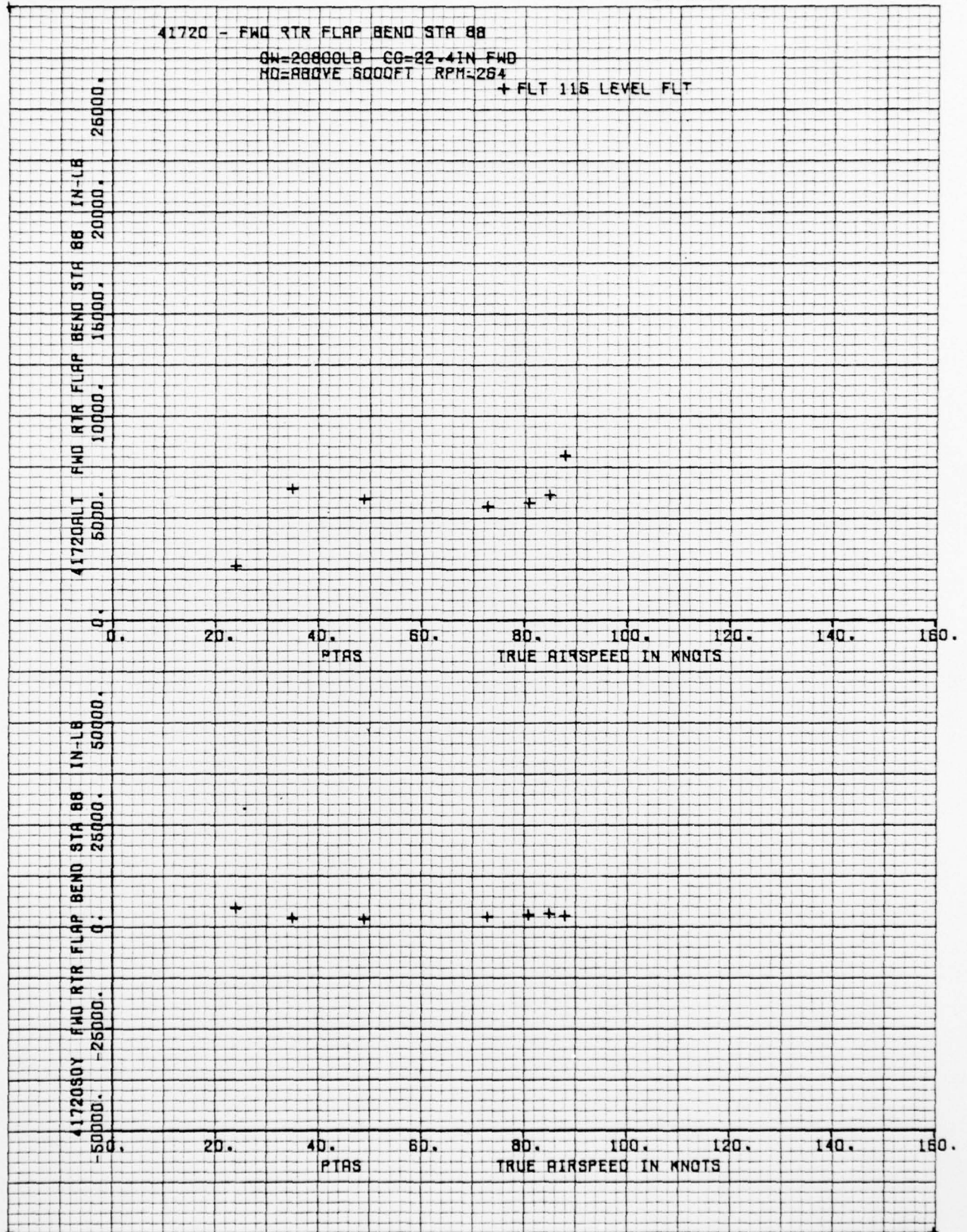
REV LTR Volume 2

MODEL NO.

4.6 Forward Blade Flap Bending Station 88.



THE **BOEING** COMPANY

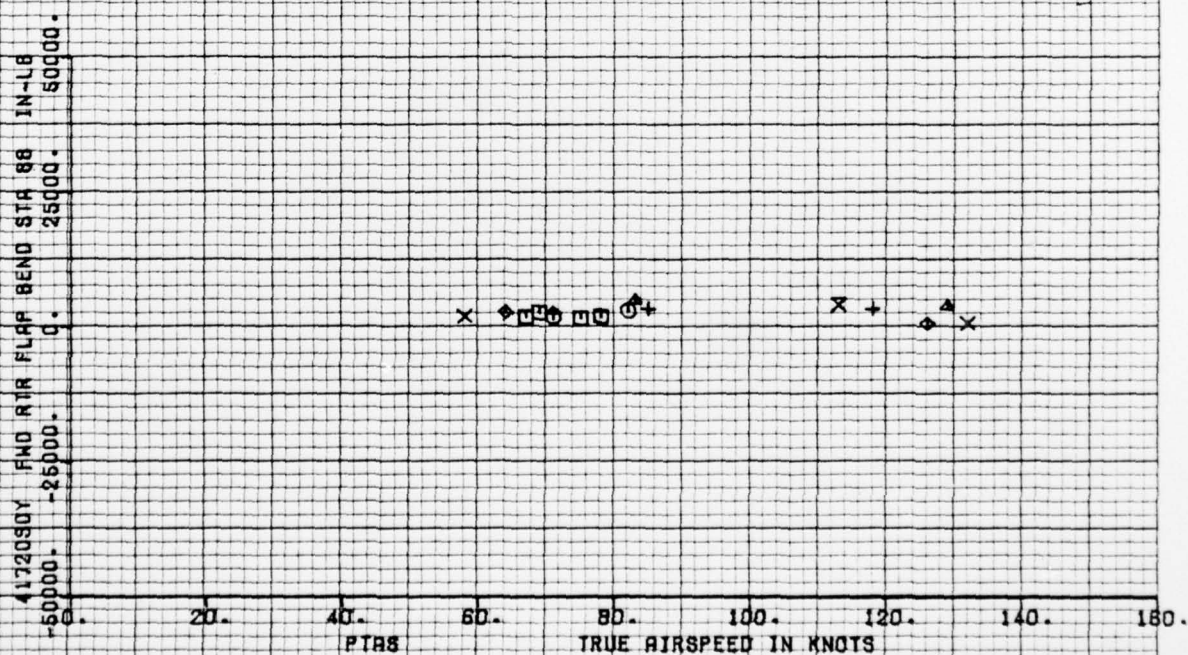
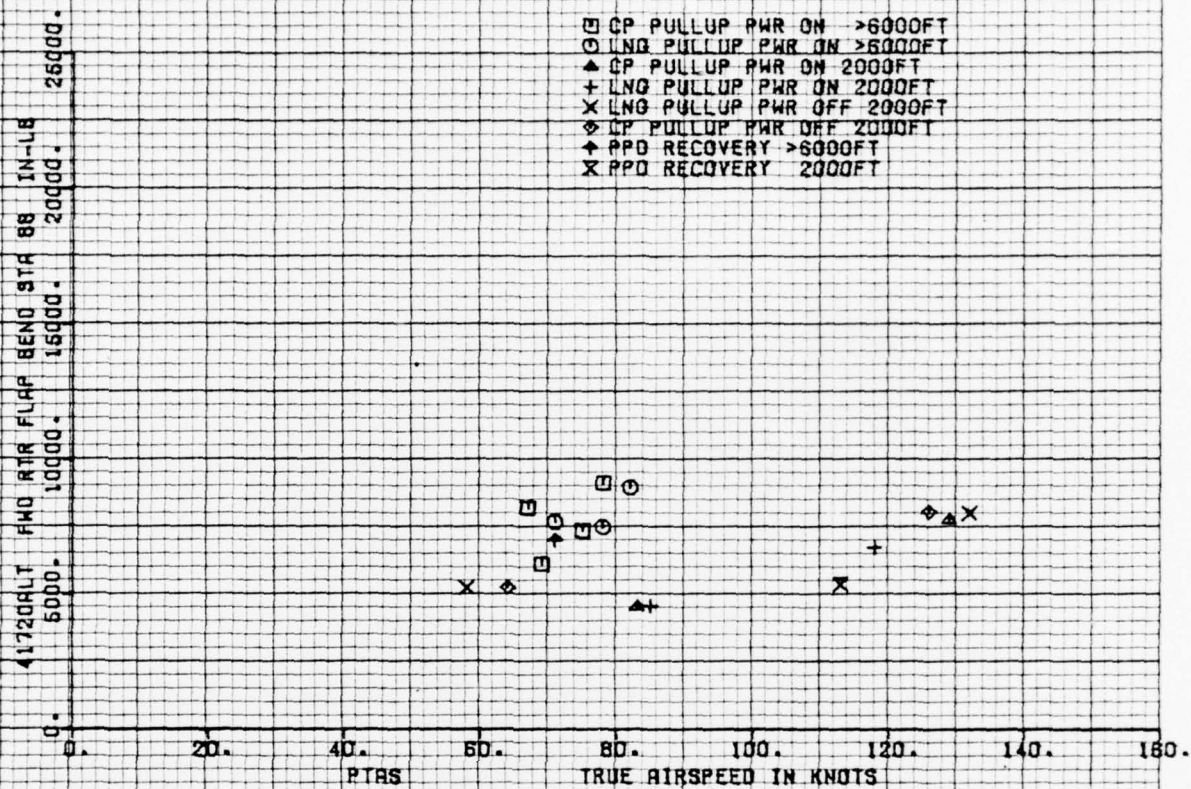


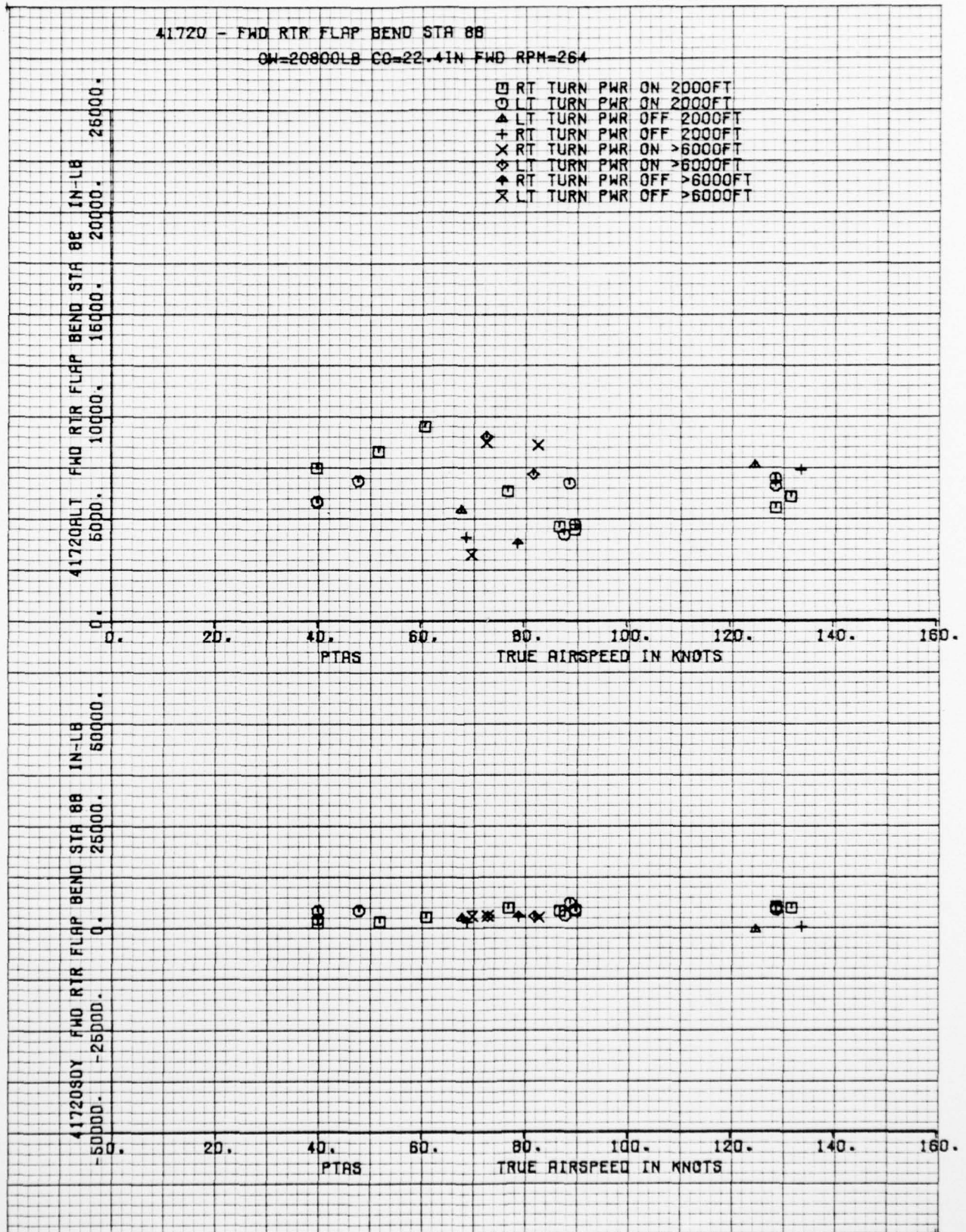
THE **BOEING** COMPANY

41720 - FWD RTR FLAP BEND STA 88

GW=20000LB CG=22.4IN FWD RPM=264

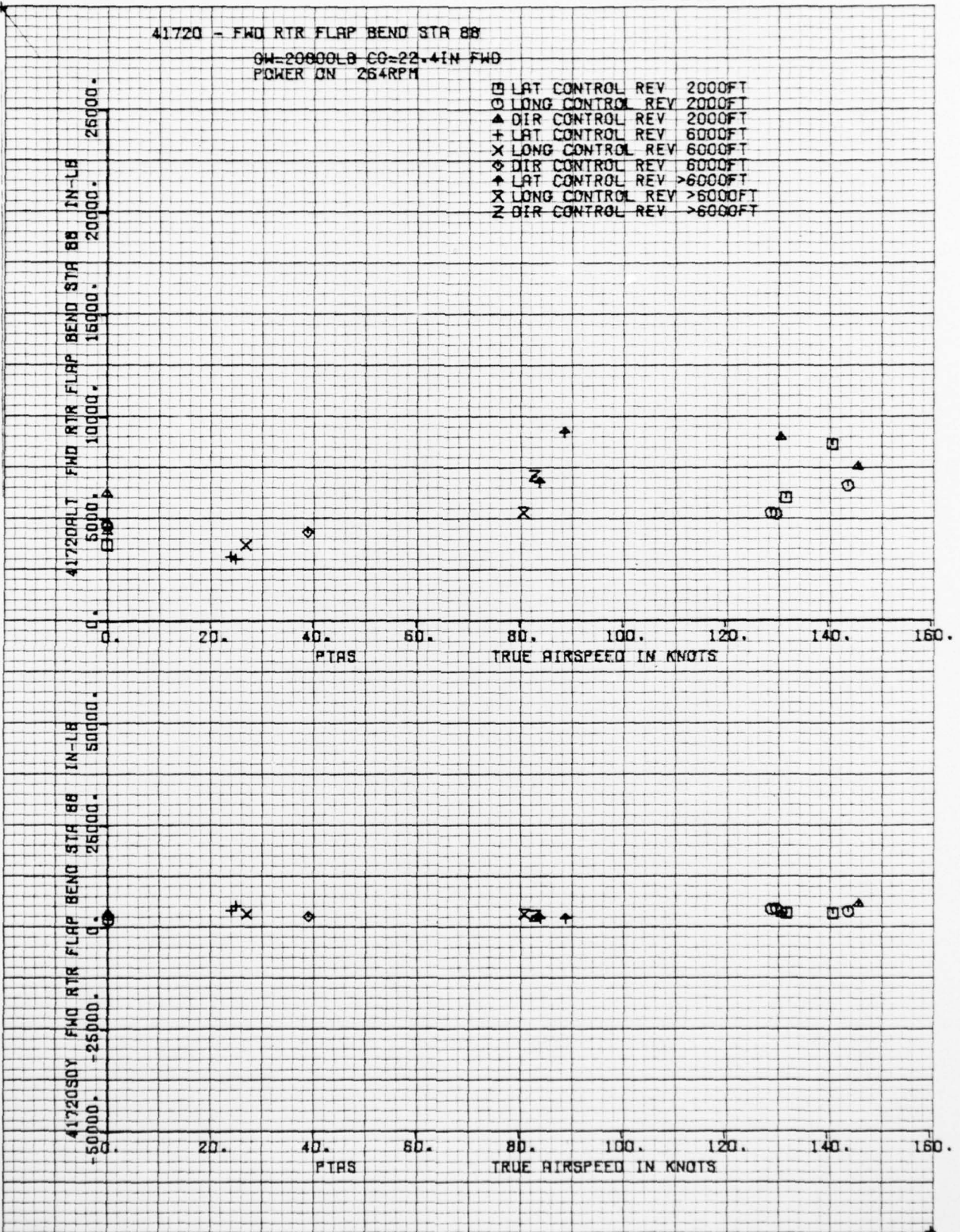
- CP PULLUP PWR ON >6000FT
- LNG PULLUP PWR ON >6000FT
- ▲ CP PULLUP PWR ON 2000FT
- + LNG PULLUP PWR ON 2000FT
- × LNG PULLUP PWR OFF 2000FT
- ◇ CP PULLUP PWR OFF 2000FT
- ↑ PPO RECOVERY >6000FT
- × PPO RECOVERY 2000FT

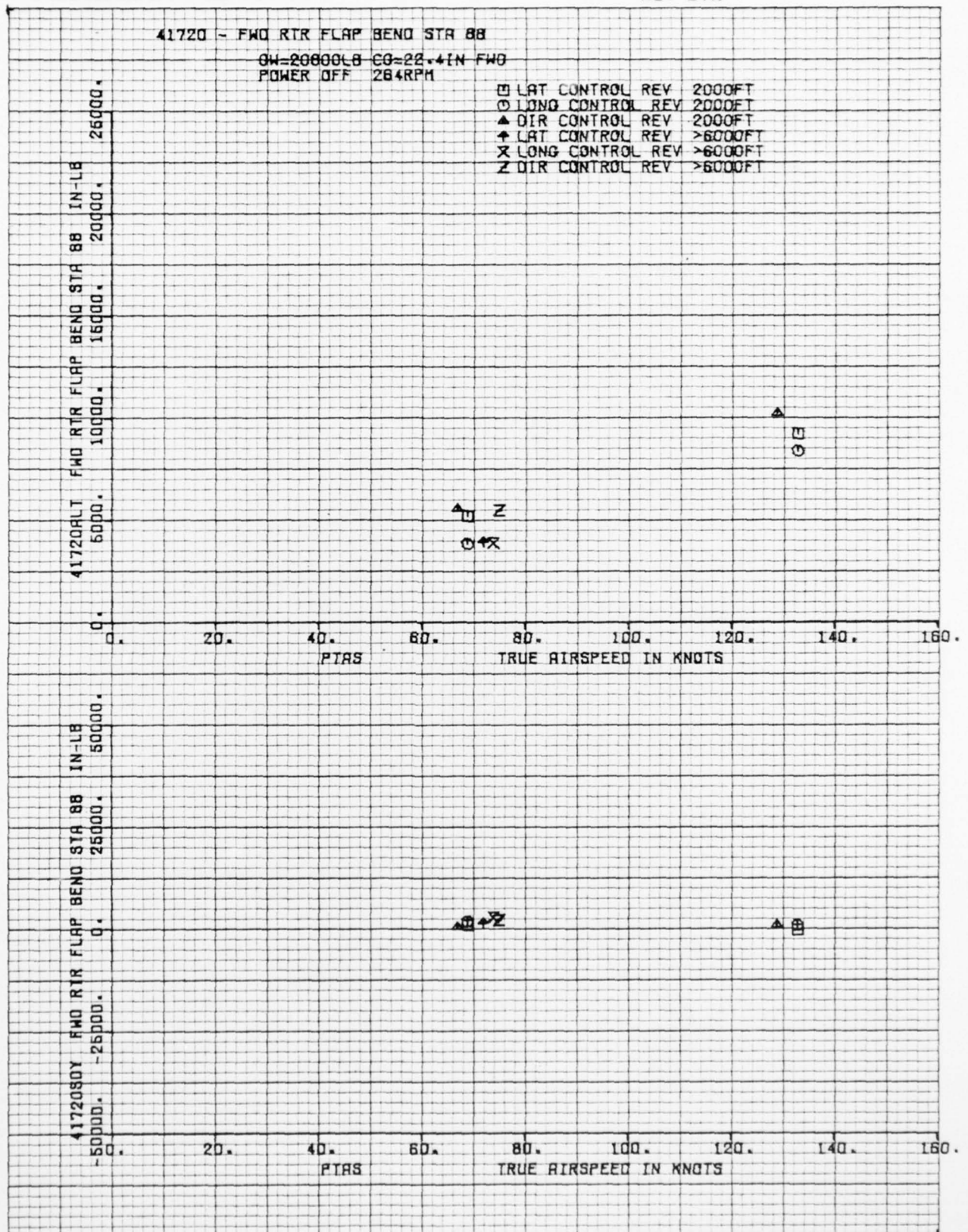


THE **BOEING** COMPANY

FORM 52300 (10/71)

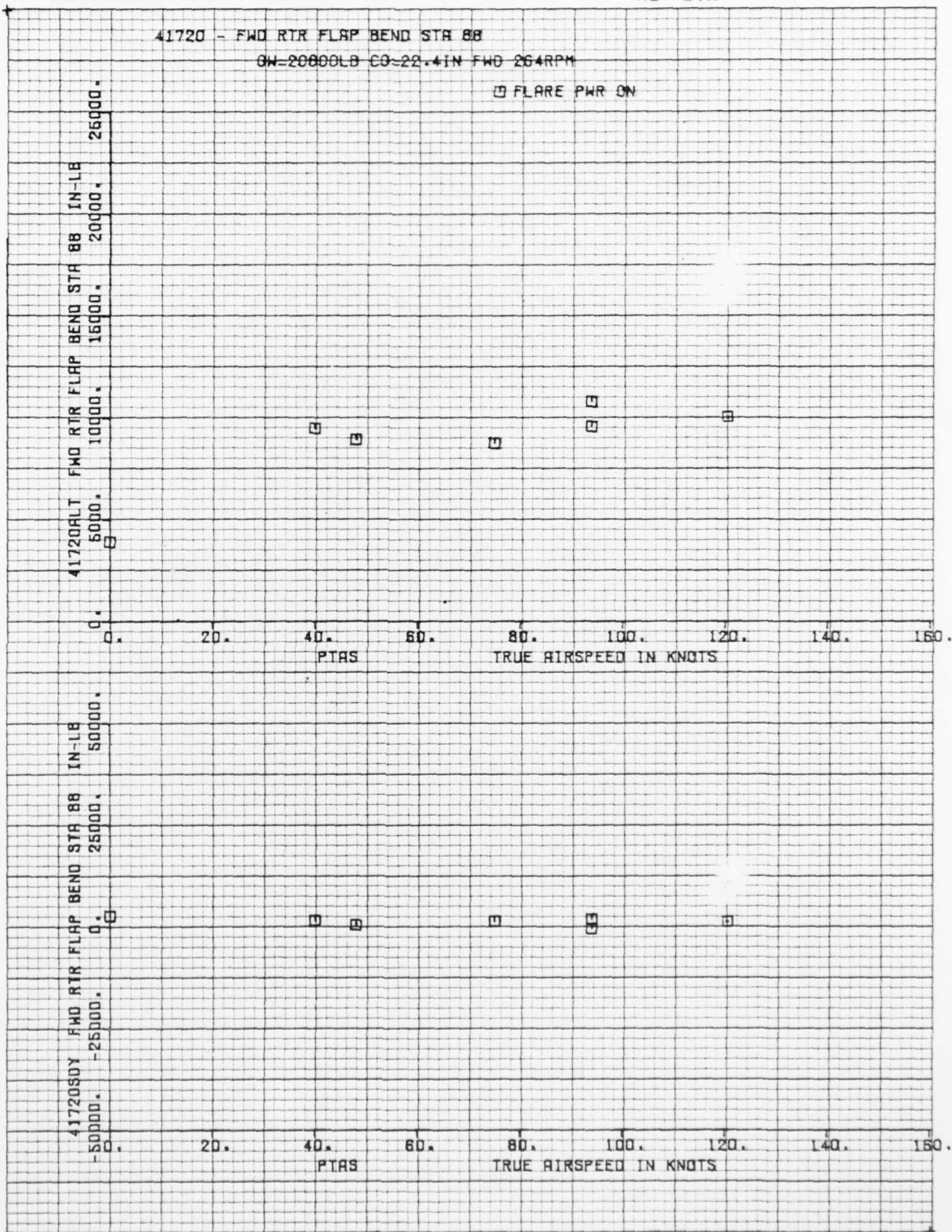
THE **BOEING** COMPANY



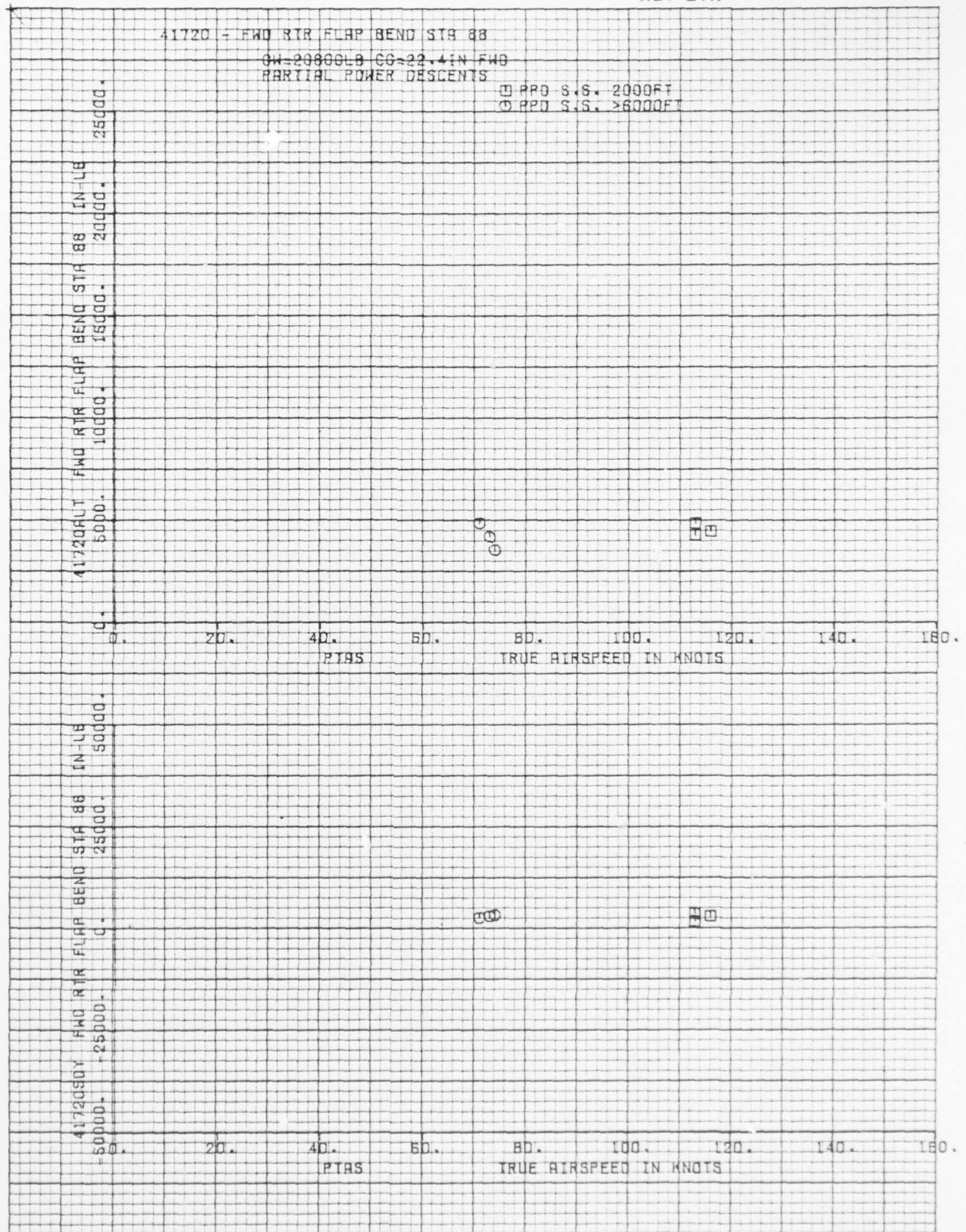
THE **BOEING** COMPANY

FORM 52300 (10/71)

THE **BOEING** COMPANY



FORM 52300 (10/71)

THE **BOEING** COMPANY

FORM 52300 (10/71)

-27

AD-A075 570

BOEING VERTOL CO PHILADELPHIA PA

F/6 1/3

CH-46 COMPOSITE ROTOR BLADE FLIGHT STRESS SURVEY DATA. VOLUME I--ETC(U)

1978 R AIELLO, J BENDO

N00019-75-C-0396

UNCLASSIFIED

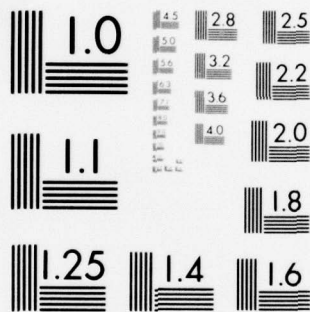
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NL

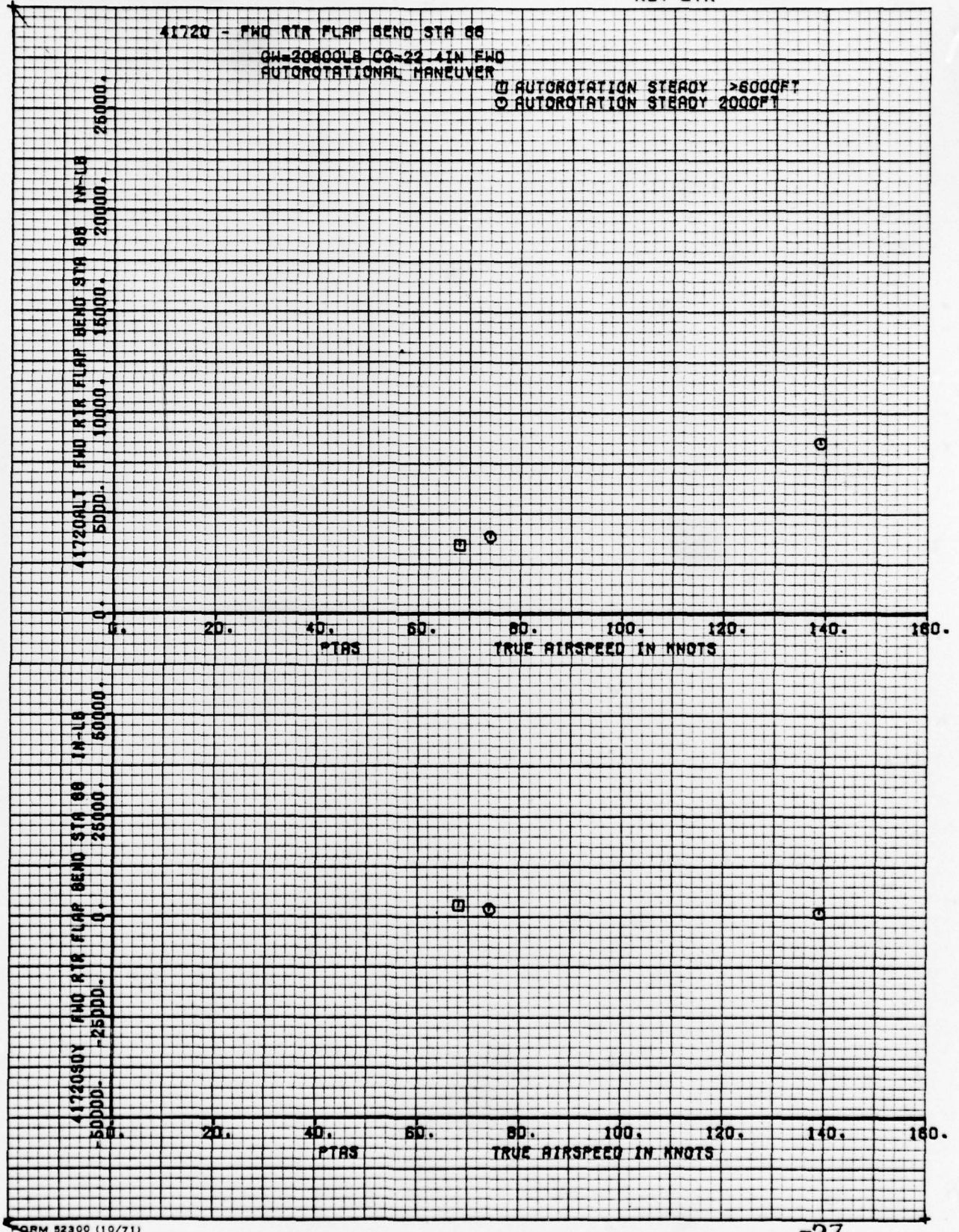
3 OF 4

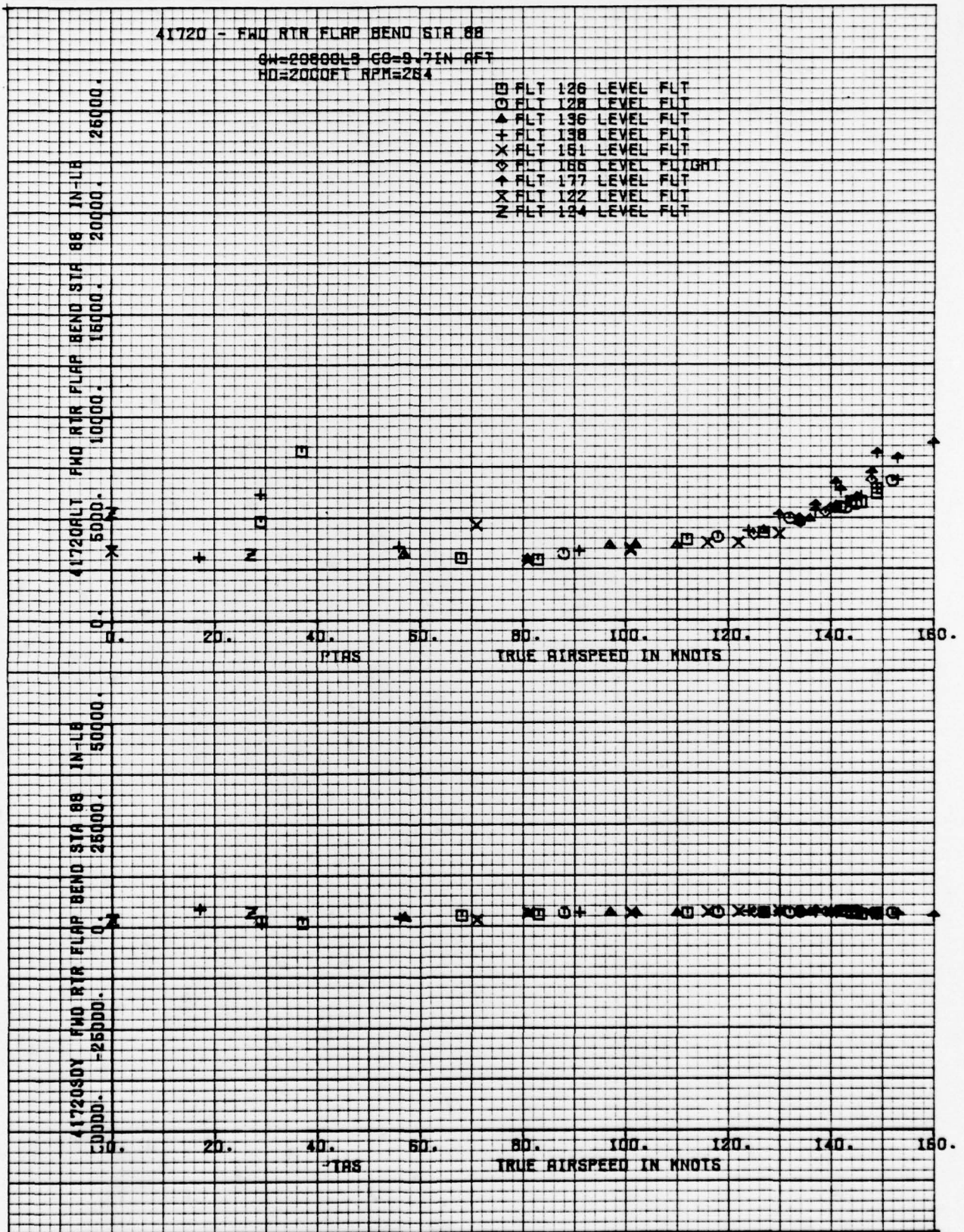
AD
A075570



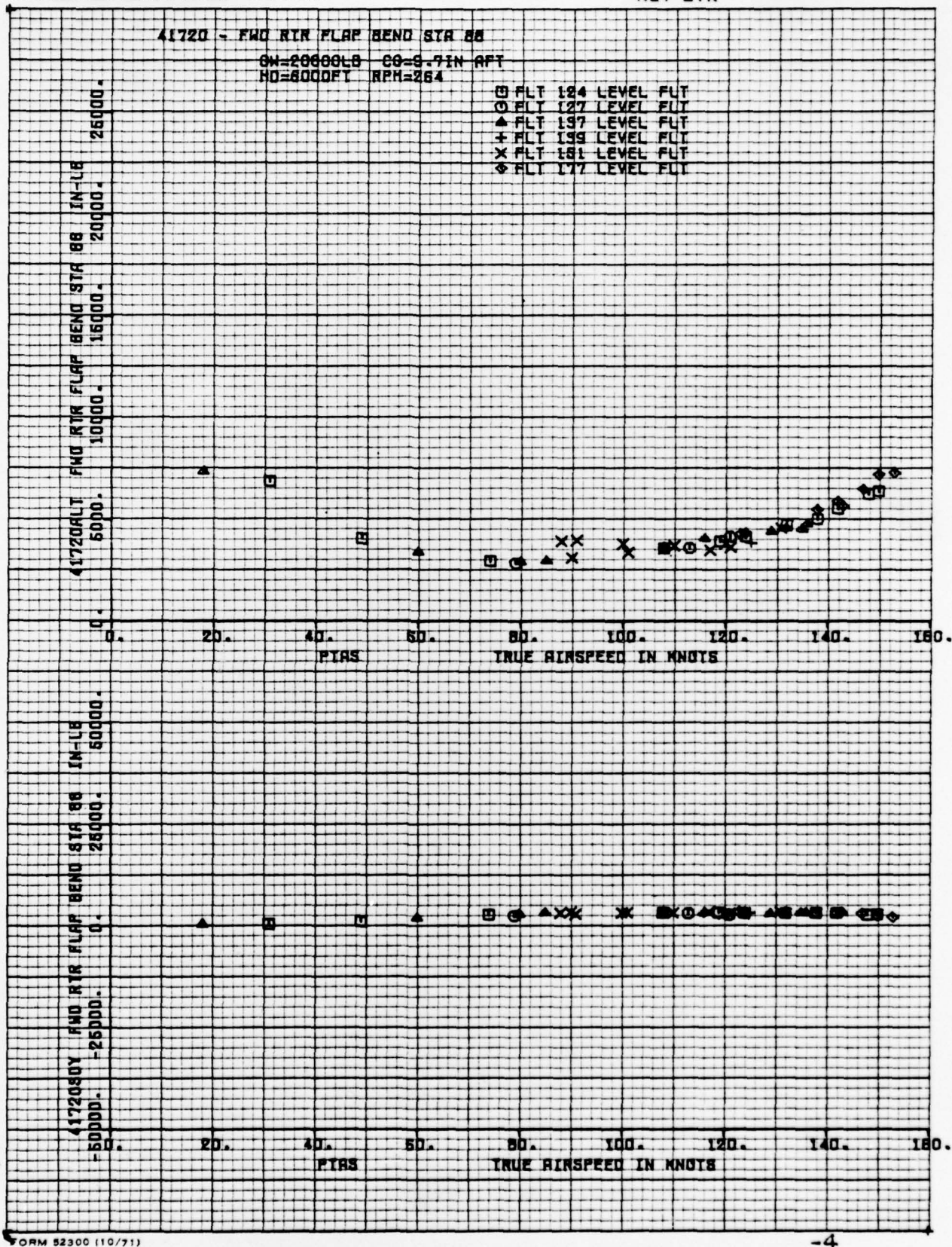


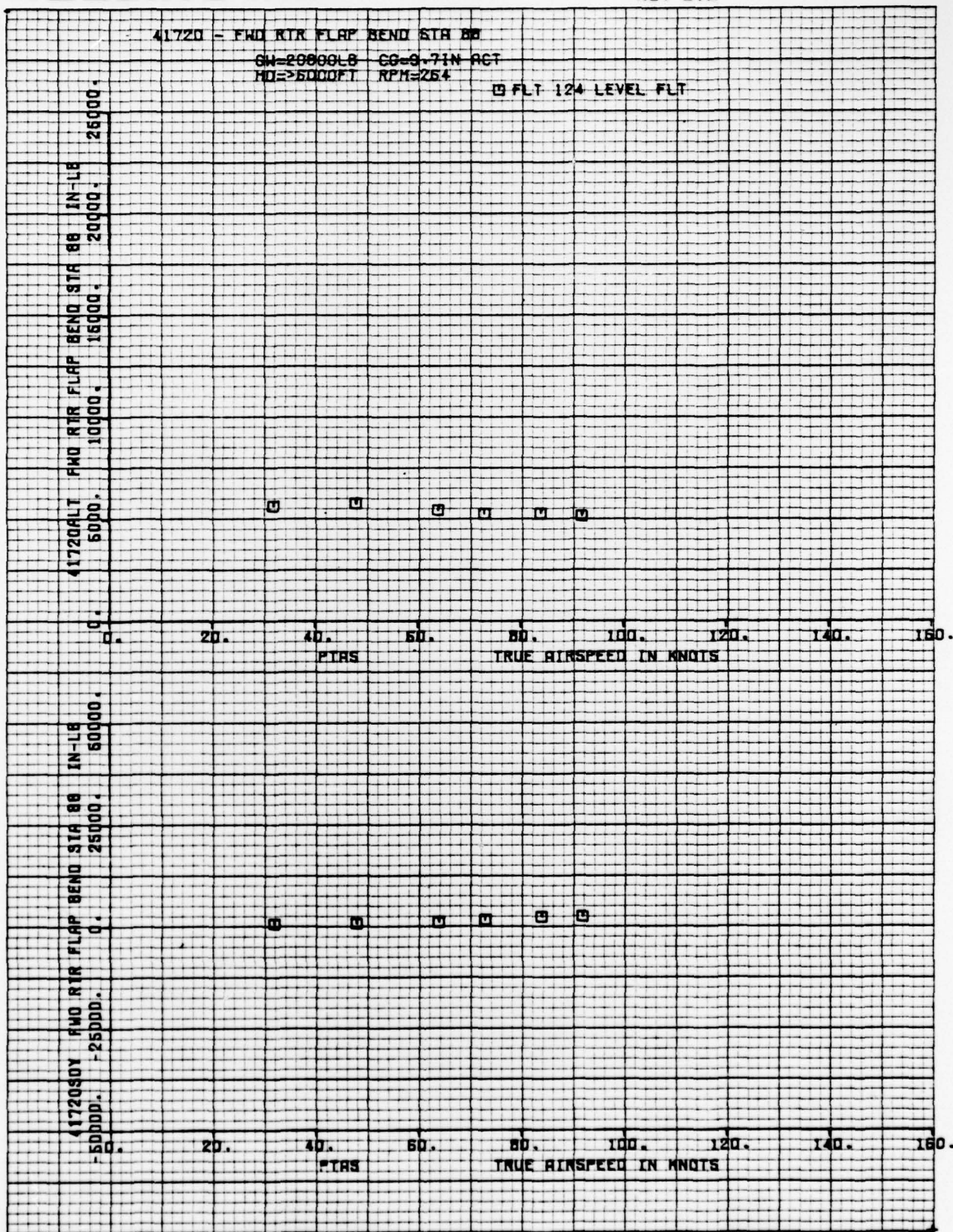
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

THE **BOEING** COMPANYNUMBER 1 VOLUME 2
REV LTR

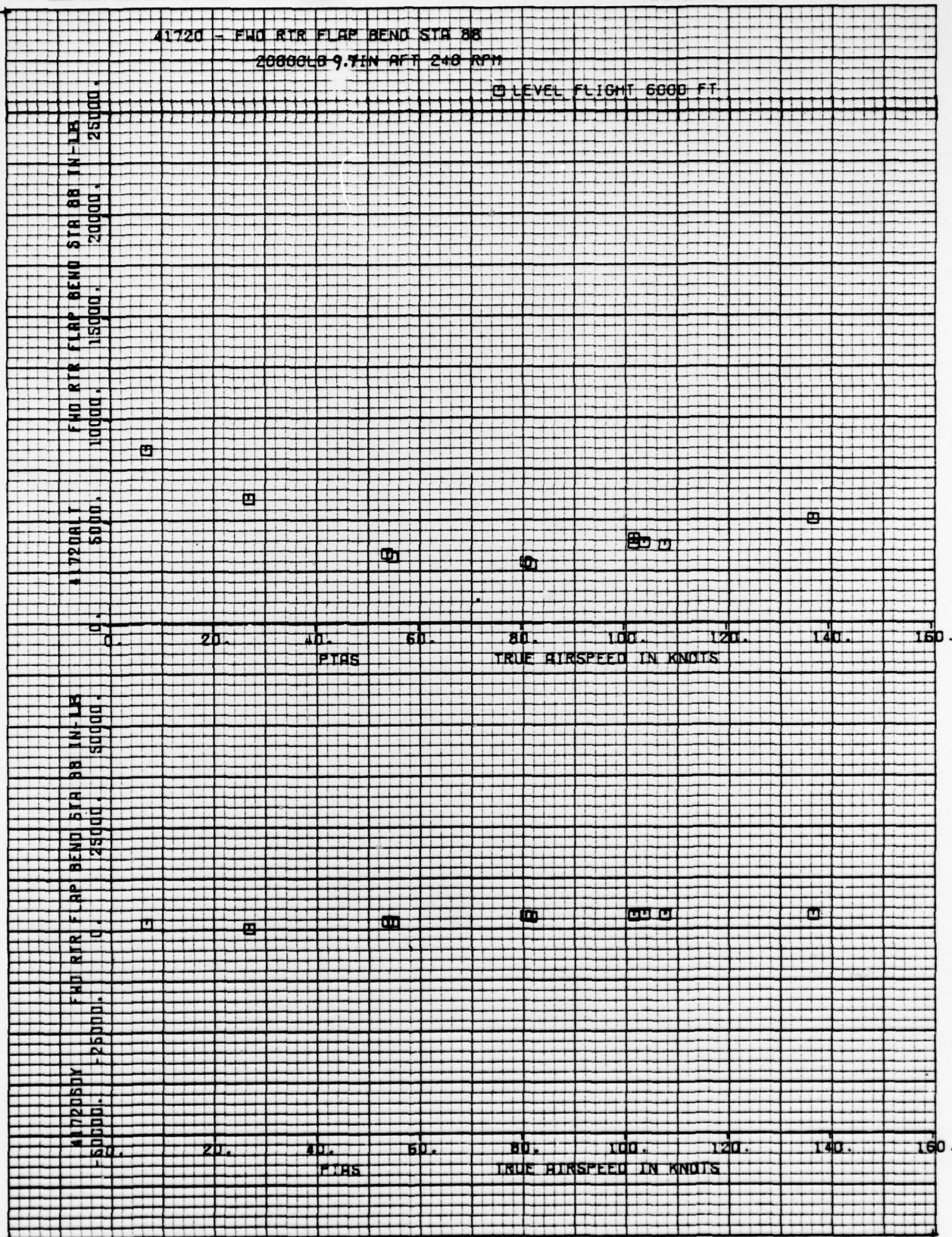
THE **BOEING** COMPANY

FORM 52300 (10/71)

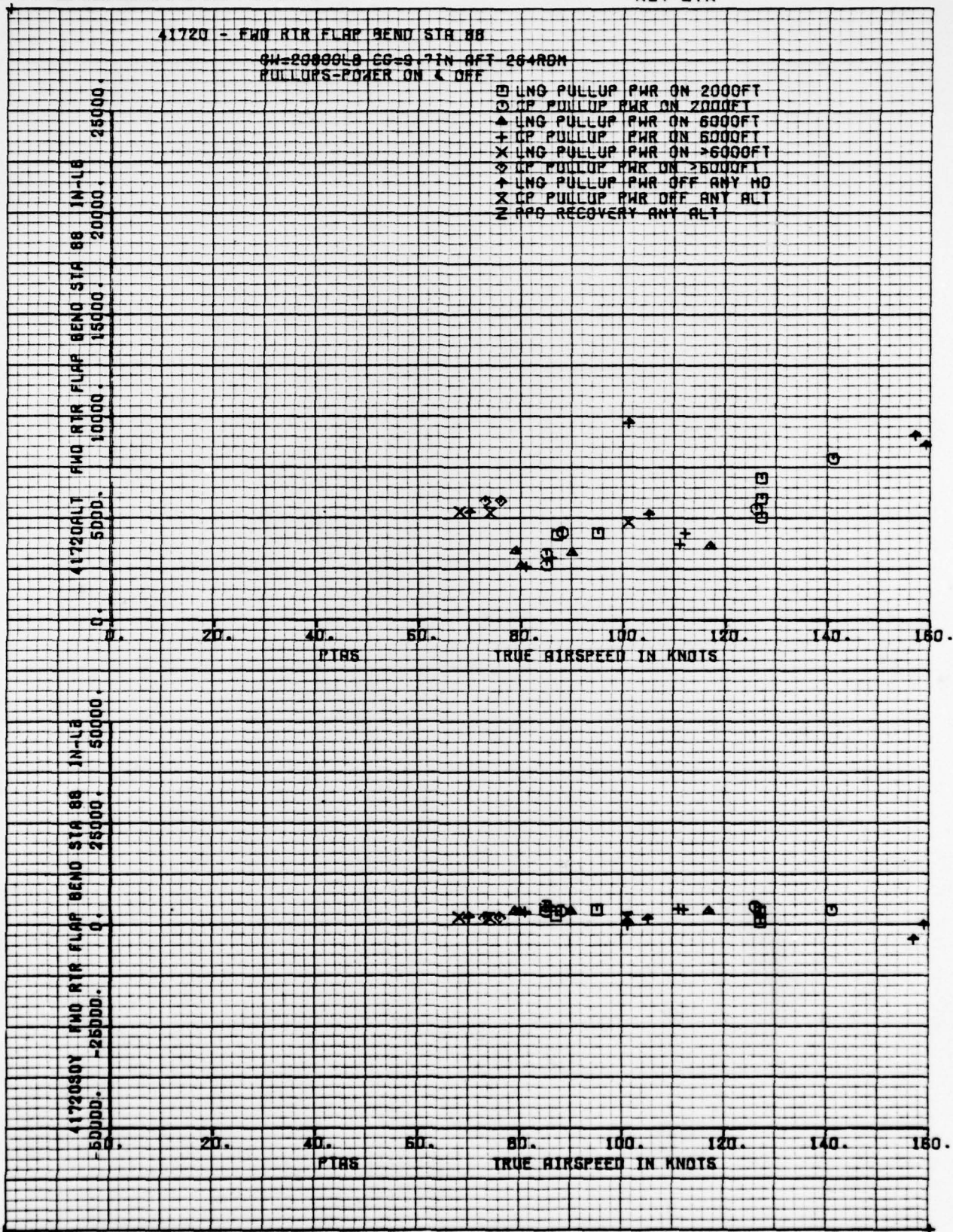


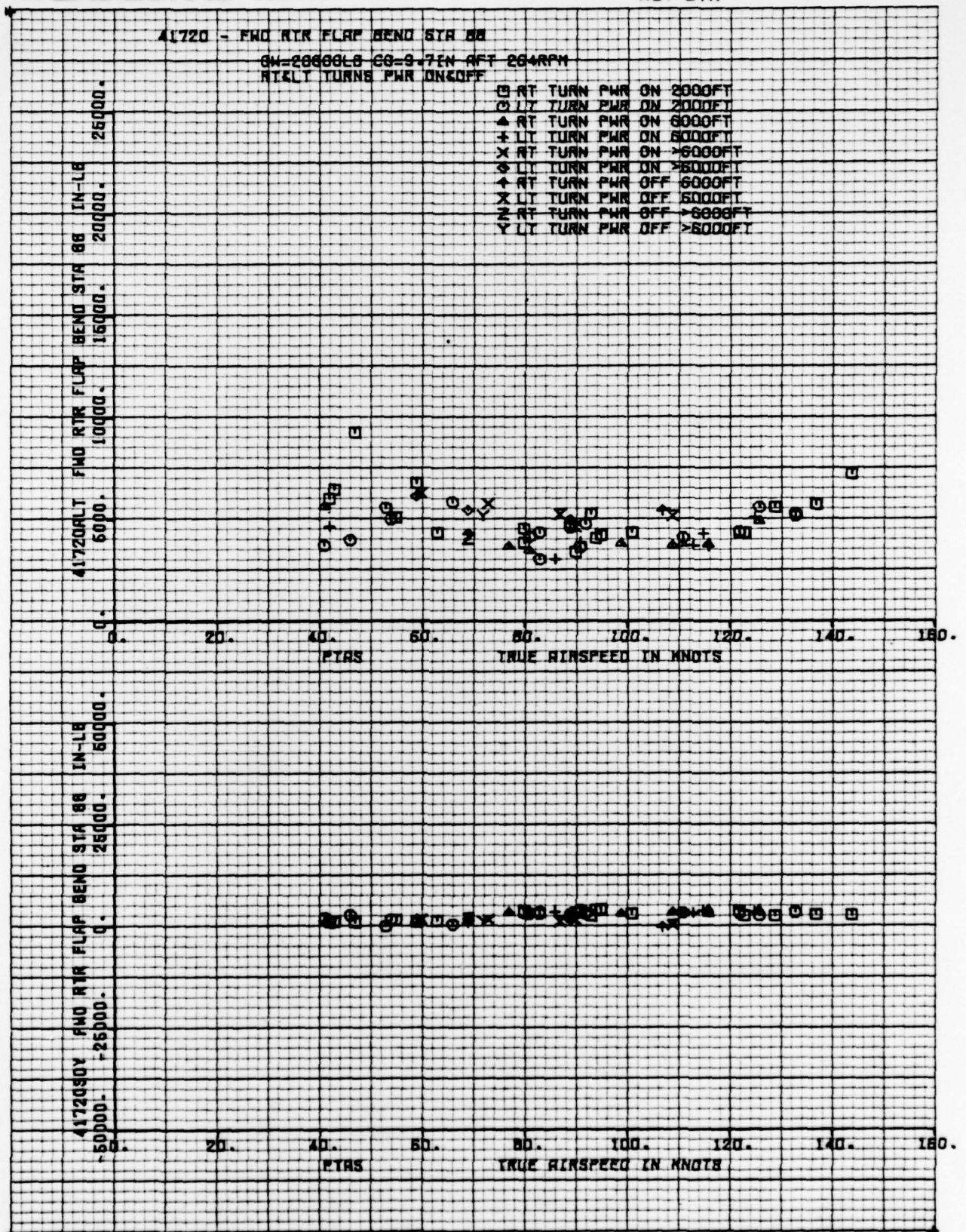


THE **BOEING** COMPANY

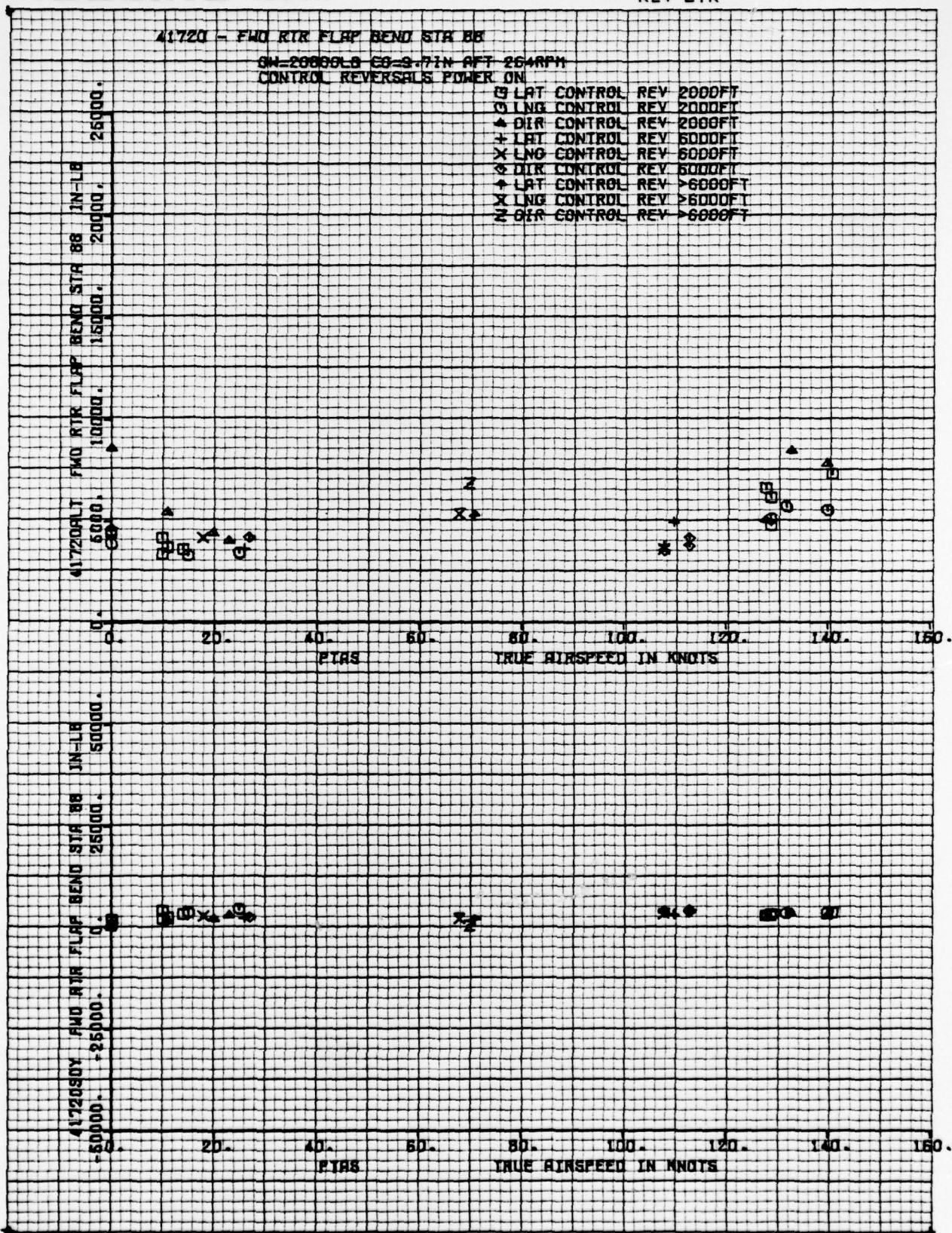


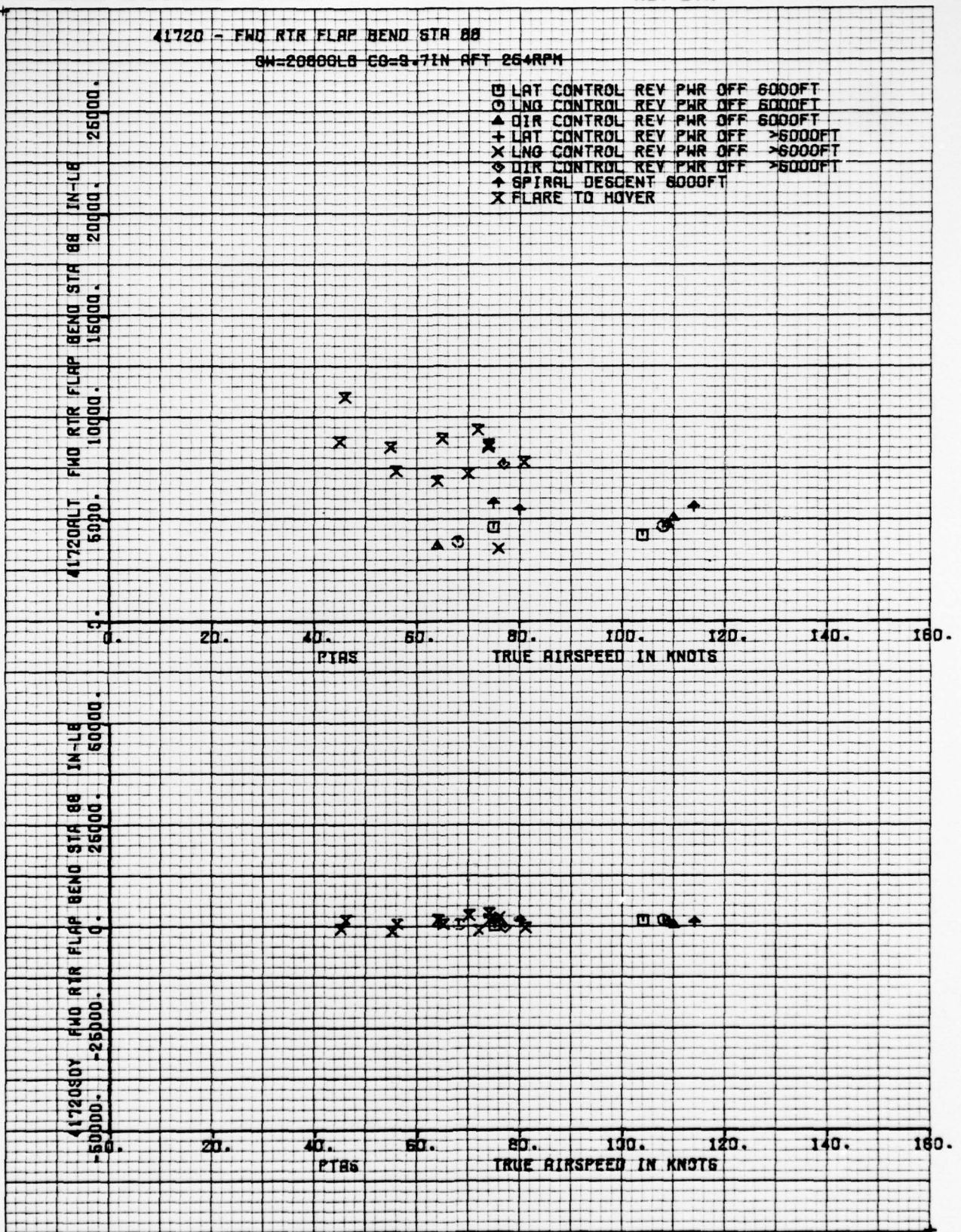
FORM 52300 (10/71)

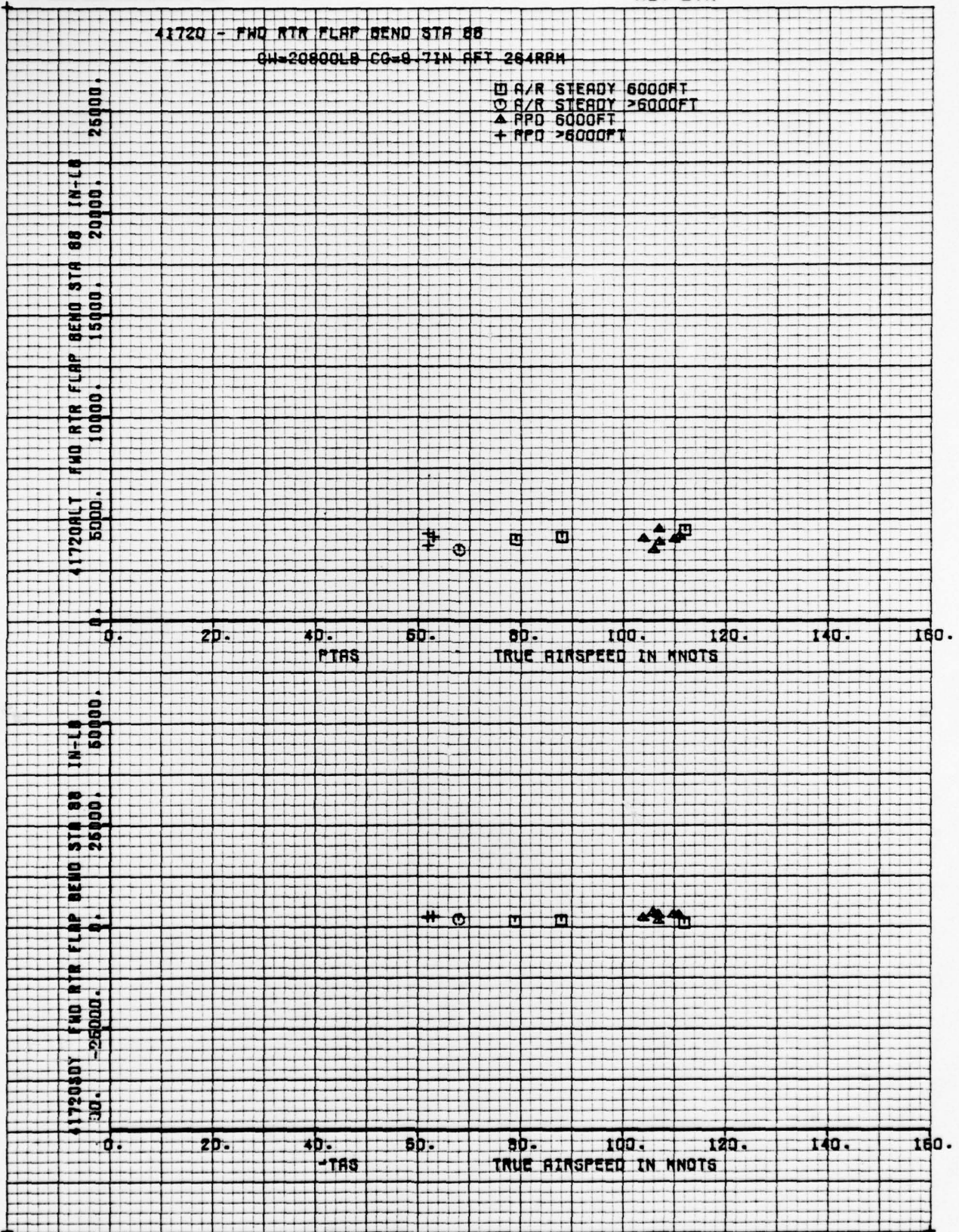


THE **BOEING** COMPANY

FORM 52300 (10/71)



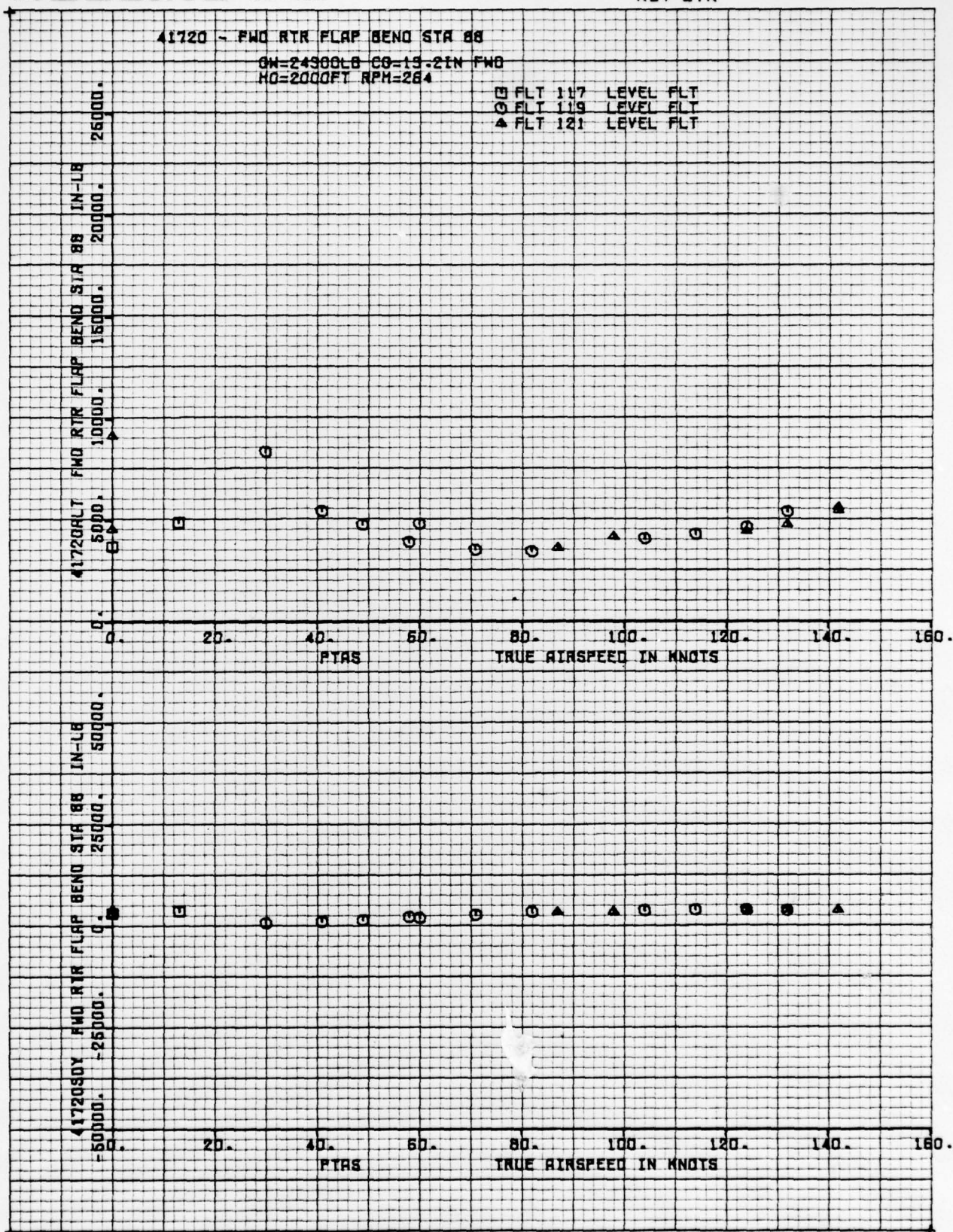
THE **BOEING** COMPANY

THE **BOEING** COMPANY

FORM 52300 (10/71)

SHEET 201

-28



41720 - FWD RTR FLAP BEND STA 88

GW=24300LB CG=13.21N FWD
HD=>6000FT RPM=264

□ FLT 121 LEVEL FLT

41720ALT FWD RTR FLAP BEND STA 88 IN-LB

0. 5000. 10000. 15000. 20000. 25000.

0. 20. 40. 60. 80. 100. 120. 140. 160.

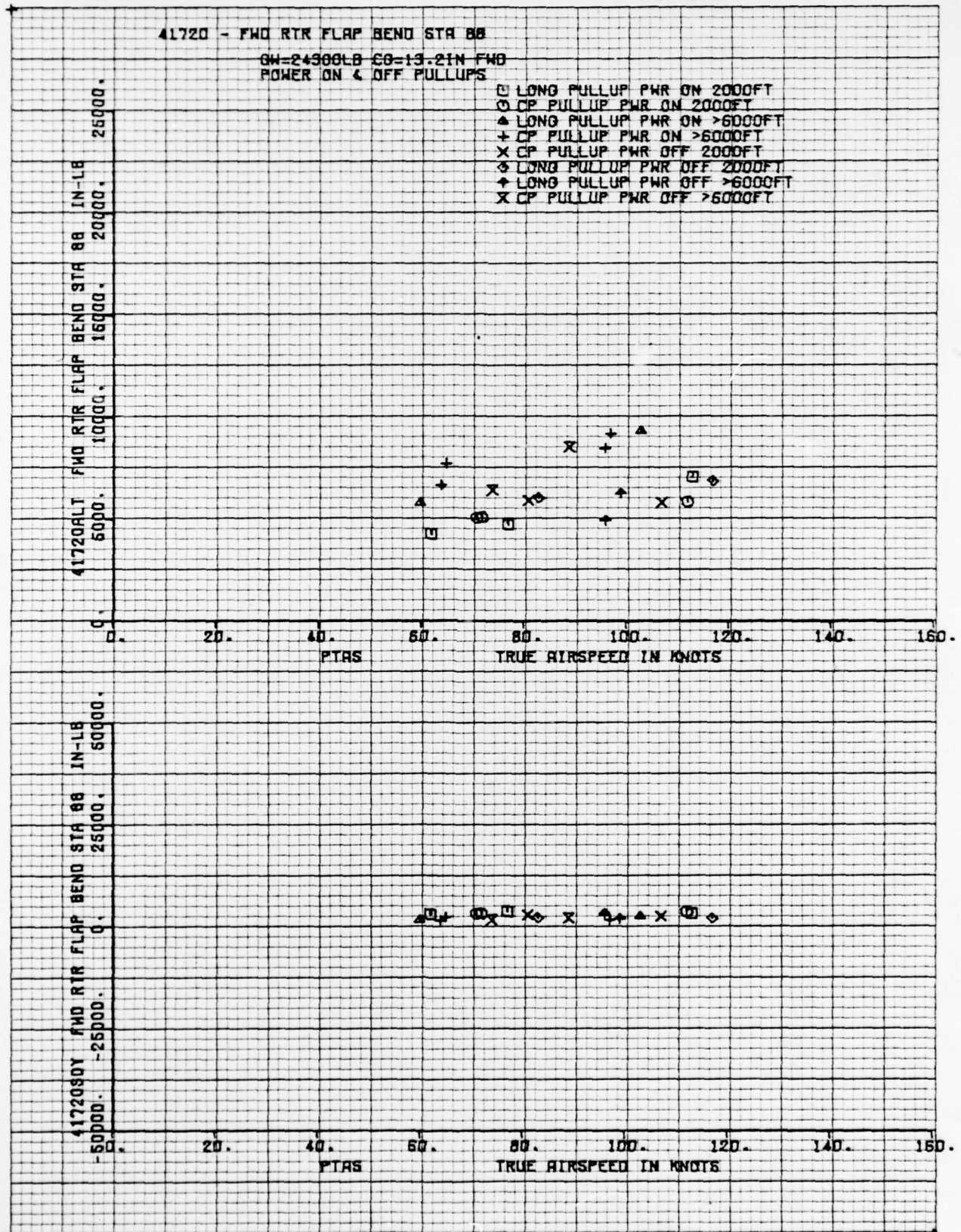
PTAS TRUE AIRSPEED IN KNOTS

4172090Y FWD RTR FLAP BEND STA 88 IN-LB

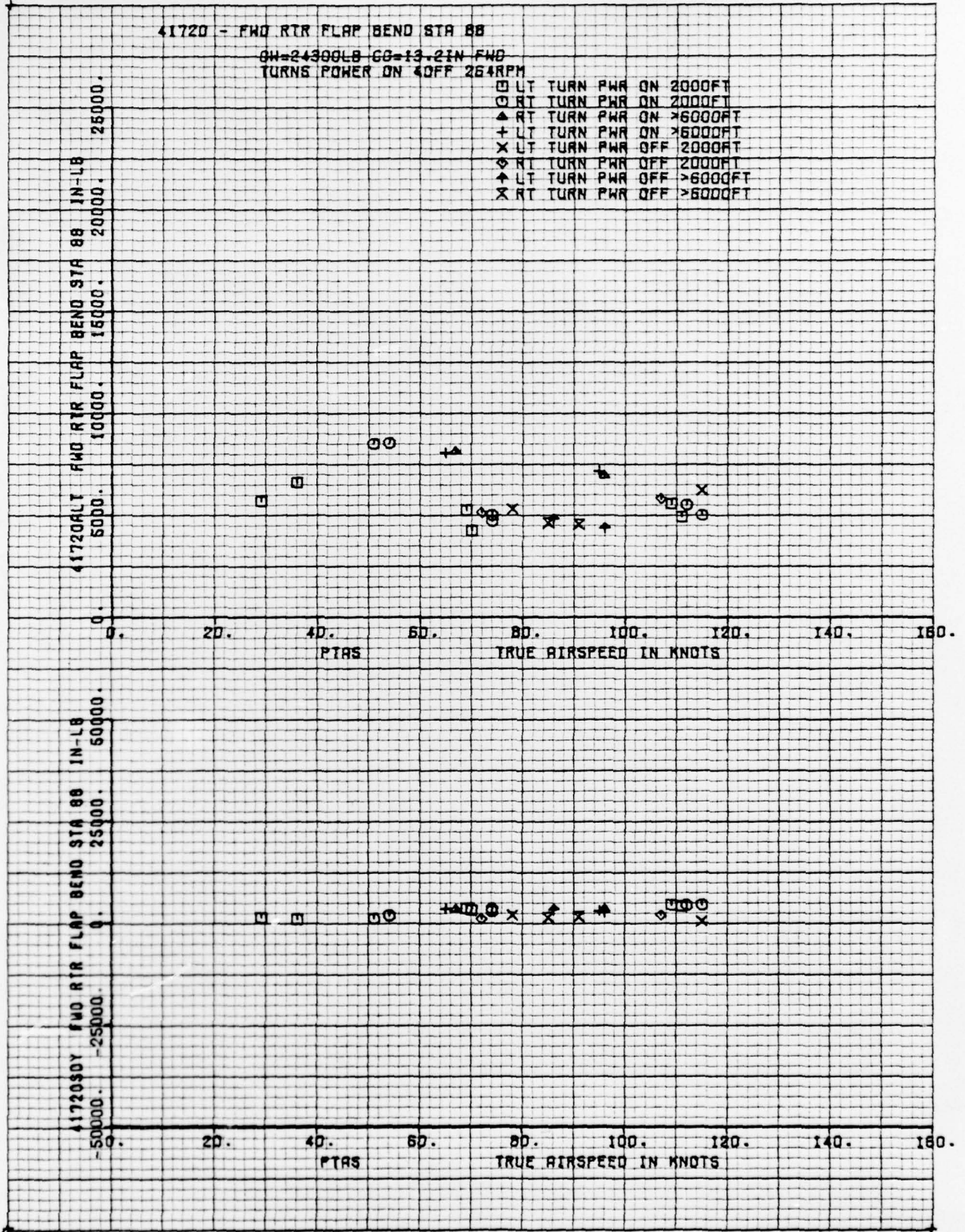
0. 25000. 50000.

0. 20. 40. 60. 80. 100. 120. 140. 160.

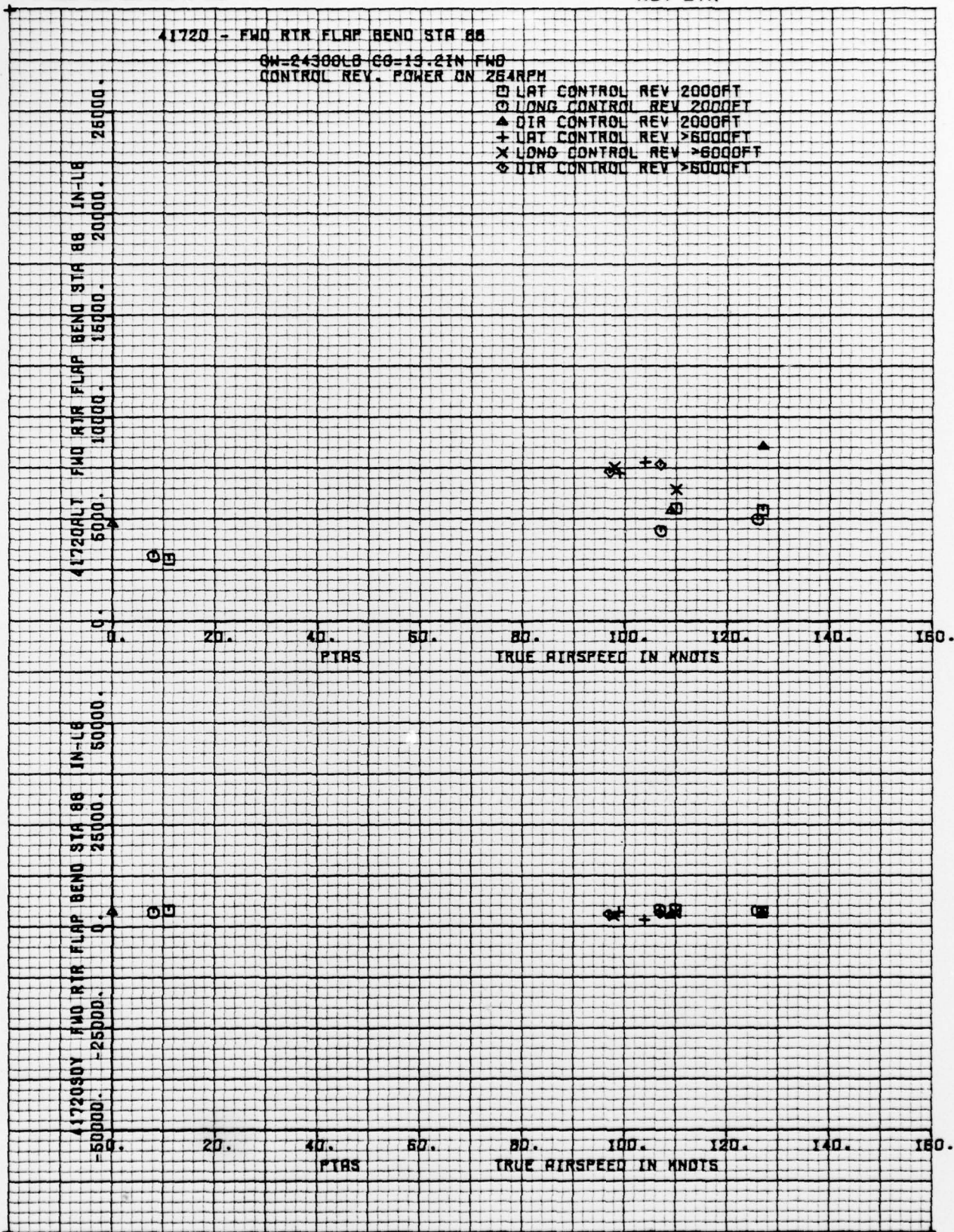
PTAS TRUE AIRSPEED IN KNOTS

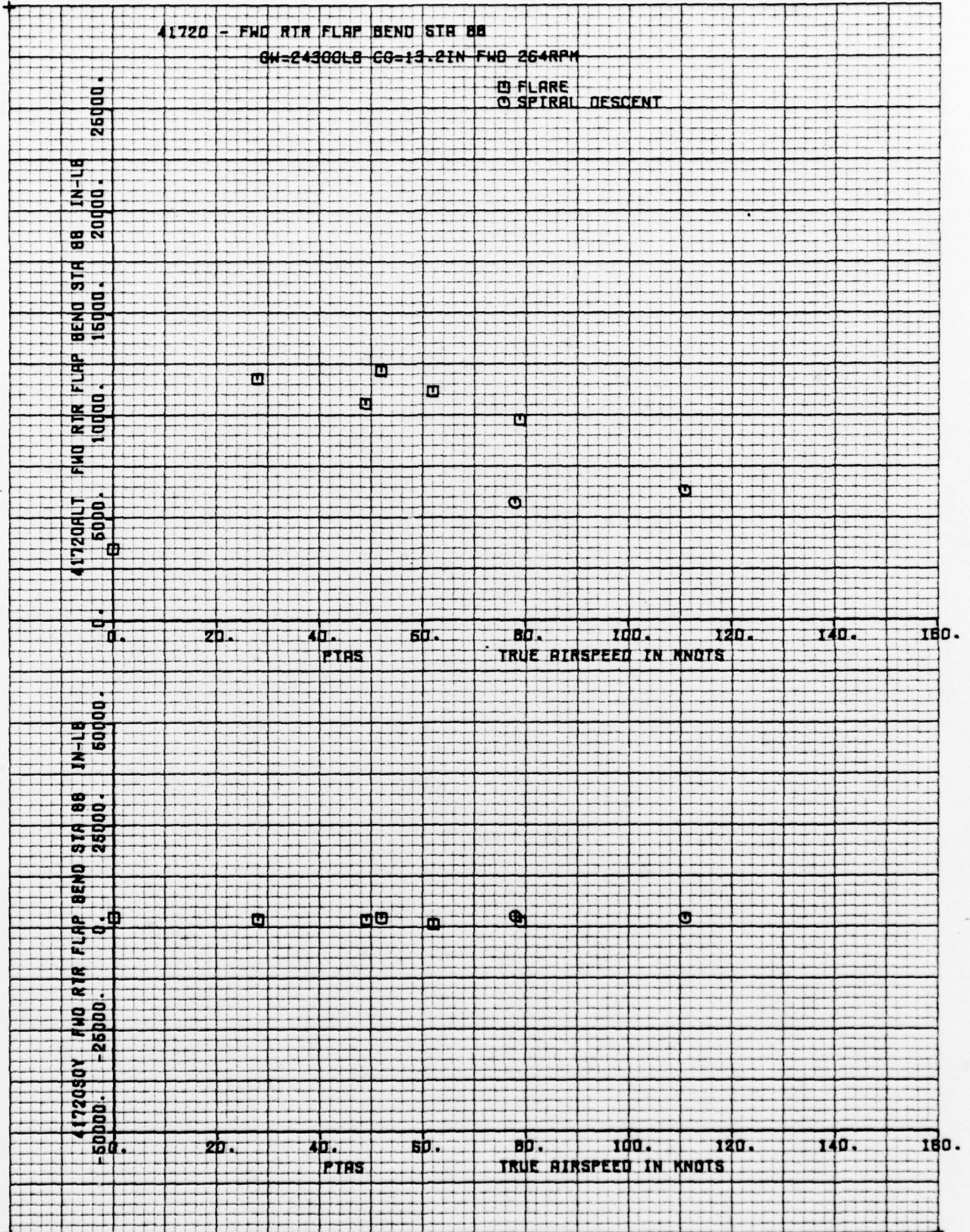
THE **BOEING** COMPANY

THE **BOEING** COMPANY

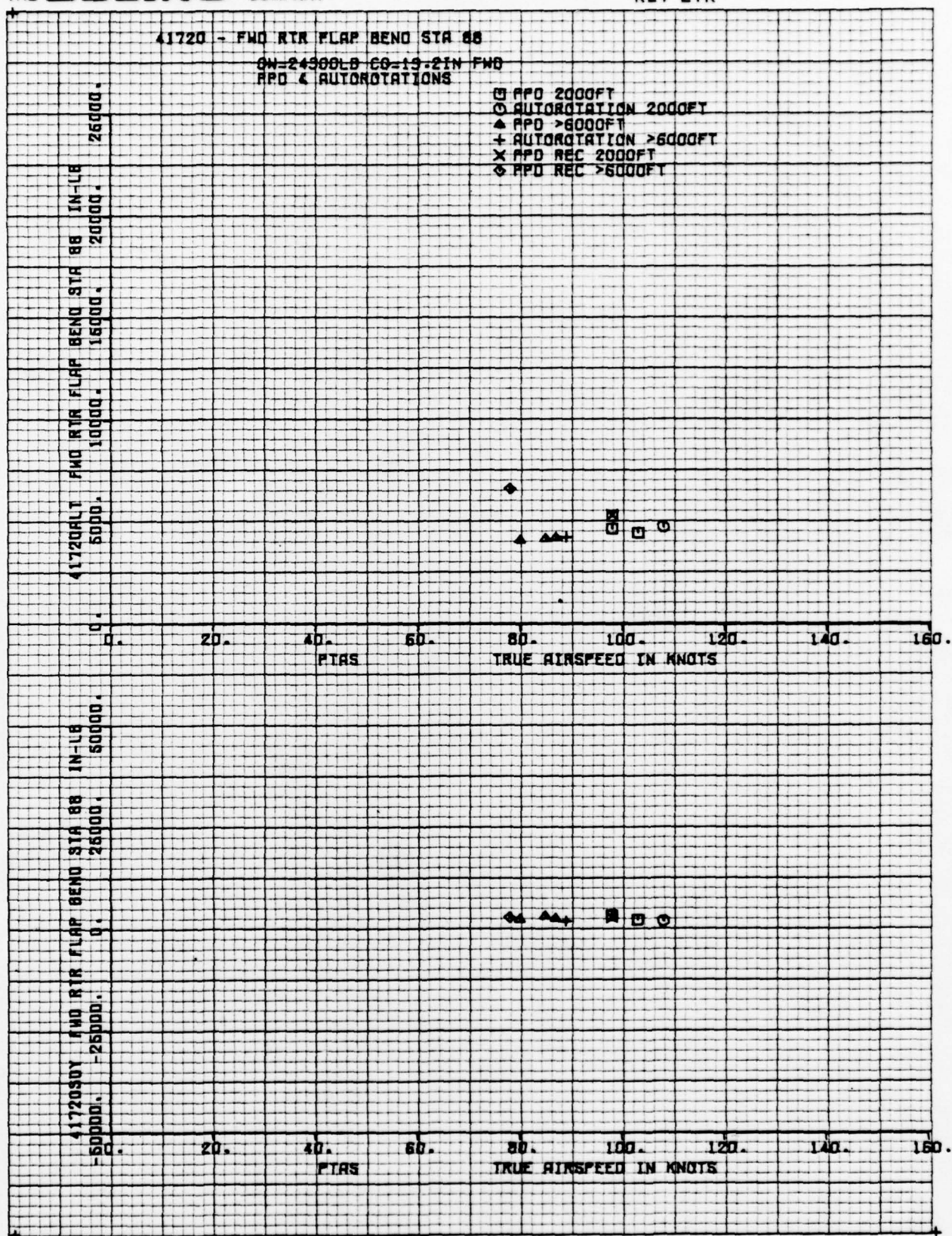


FORM 52300 (10/71)

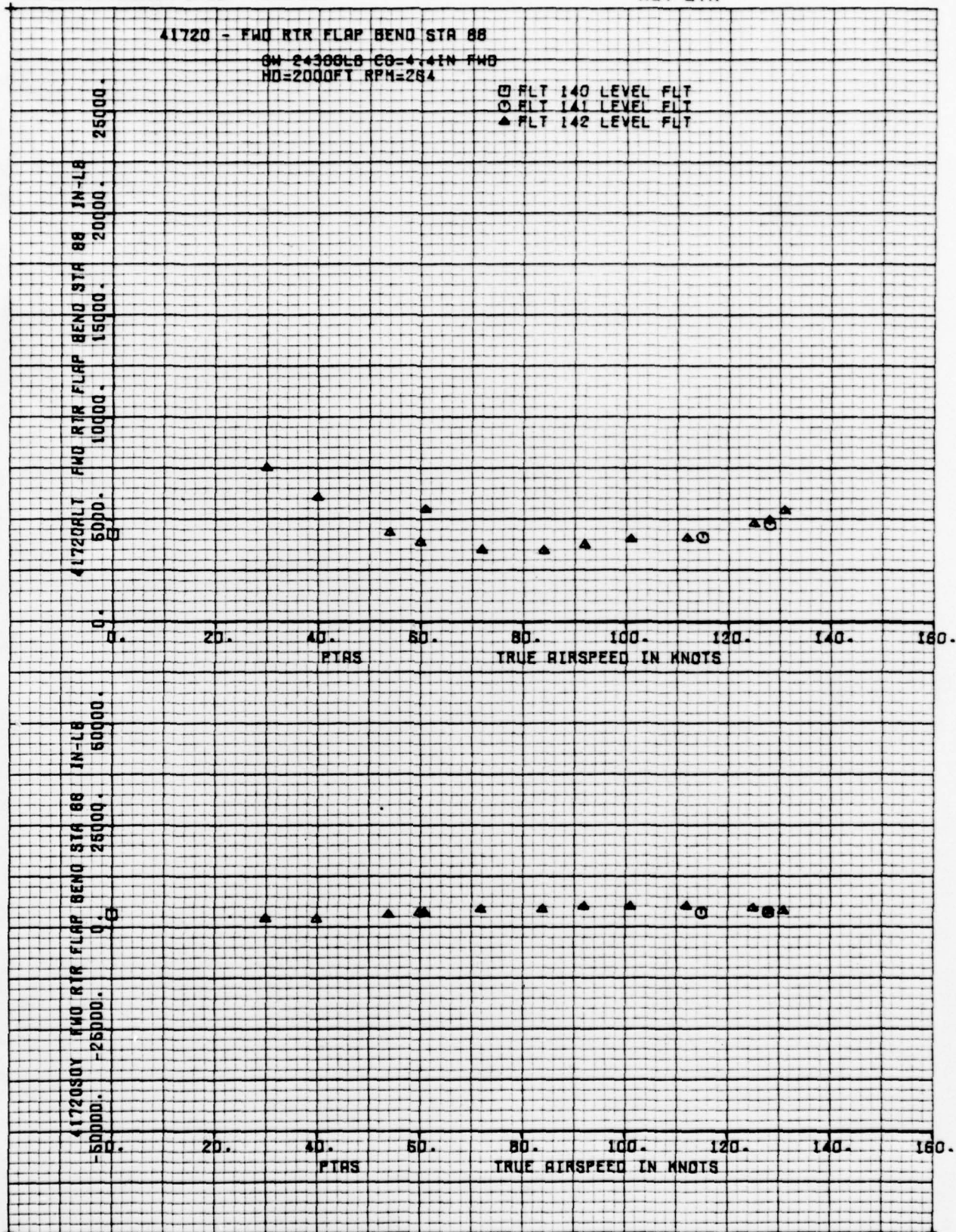


THE **BOEING** COMPANY

FORM 52300 (10/71)

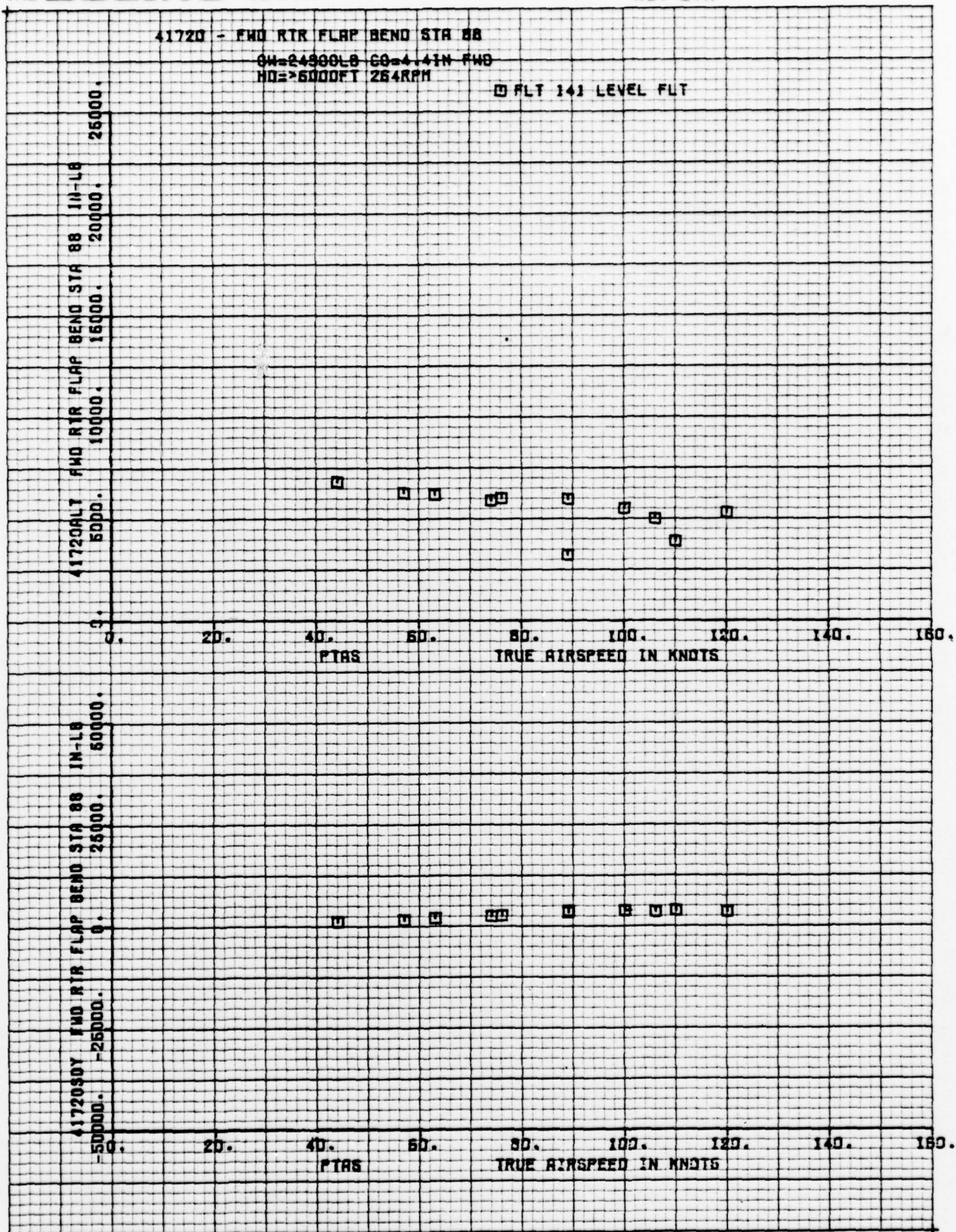
THE **BOEING** COMPANY

FORM 52300 (10/71)

THE **BOEING** COMPANY

FORM 52300 (10/71)

THE **BOEING** COMPANY

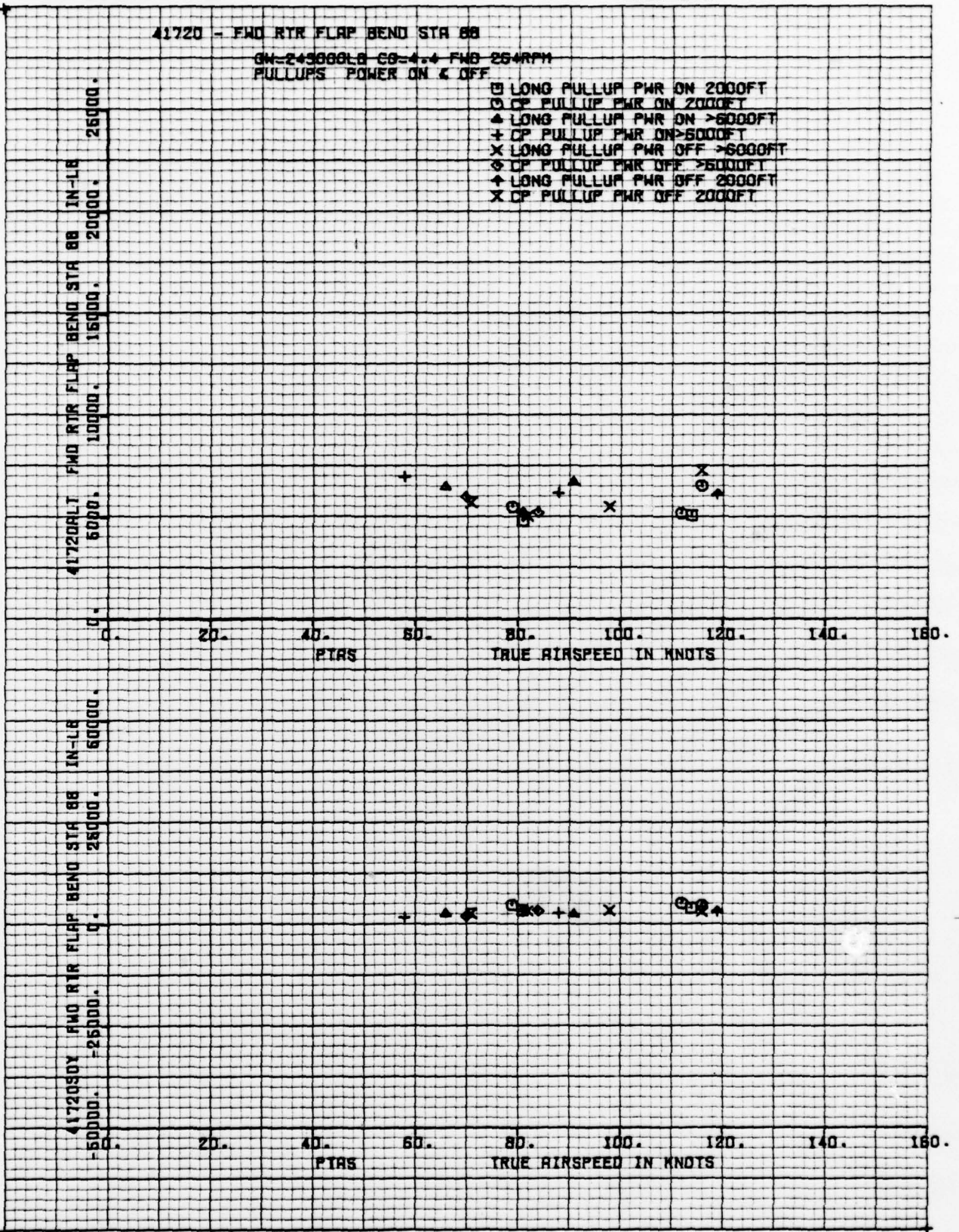


THE **BOEING** COMPANY

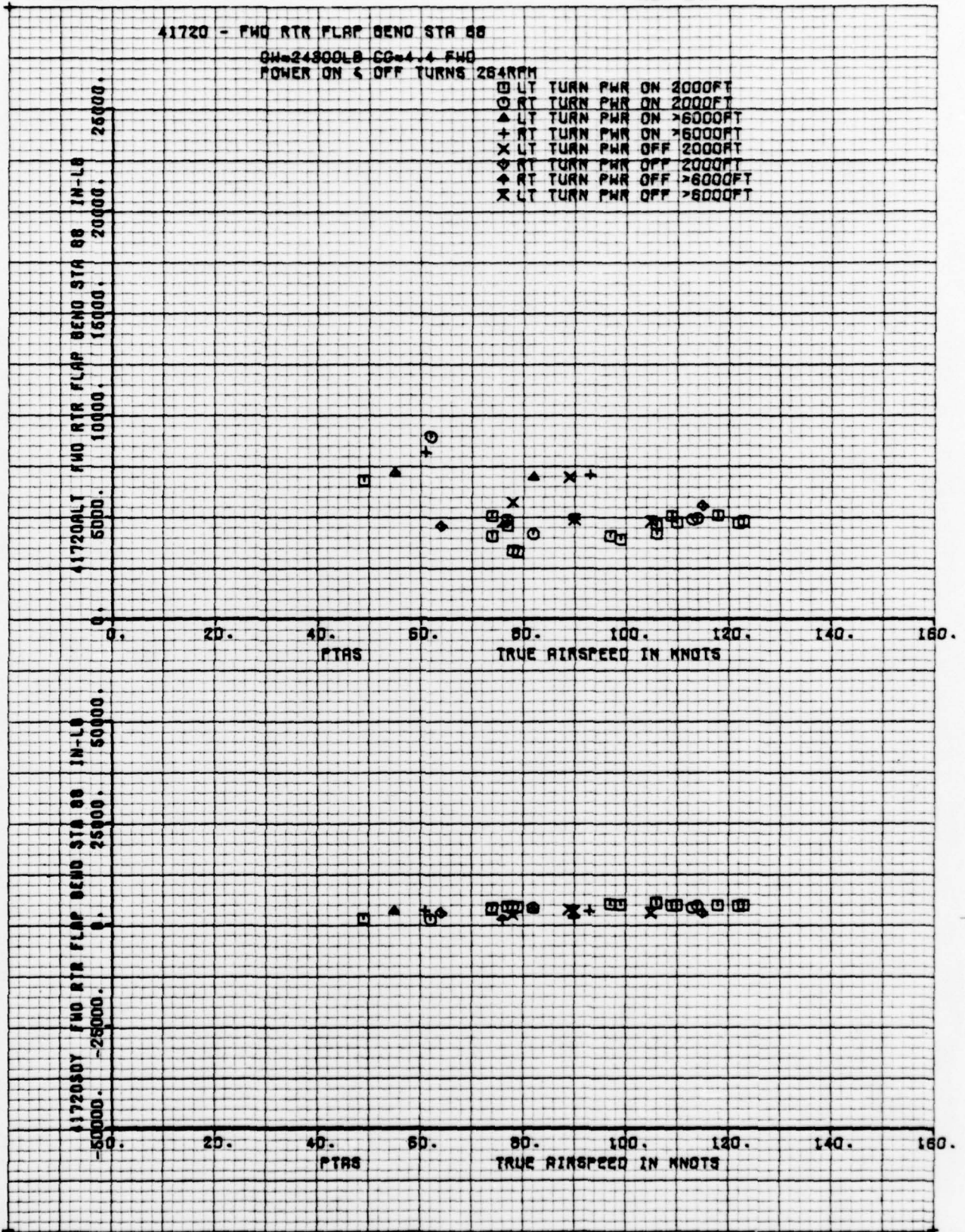
41720 - FWD RTR FLAP BEND STA 88

GN-243888LB CS-4.4 FWD 264RPM
PULLUPS POWER ON & OFF

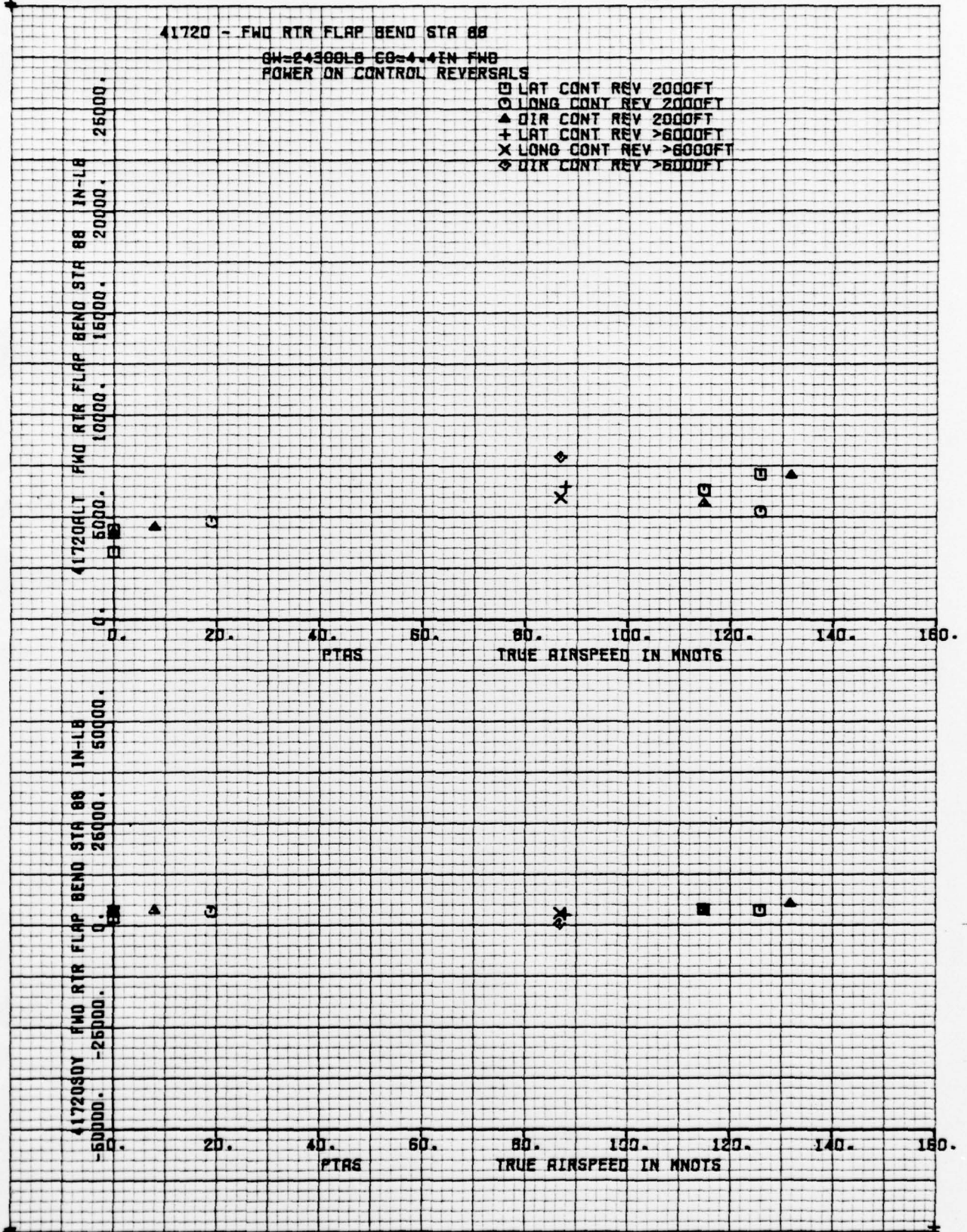
- LONG PULLUP PWR ON 2000FT
- CP PULLUP PWR ON 2000FT
- ▲ LONG PULLUP PWR ON >6000FT
- + CP PULLUP PWR ON >6000FT
- × LONG PULLUP PWR OFF >6000FT
- ◇ CP PULLUP PWR OFF >6000FT
- ◆ LONG PULLUP PWR OFF 2000FT
- × CP PULLUP PWR OFF 2000FT



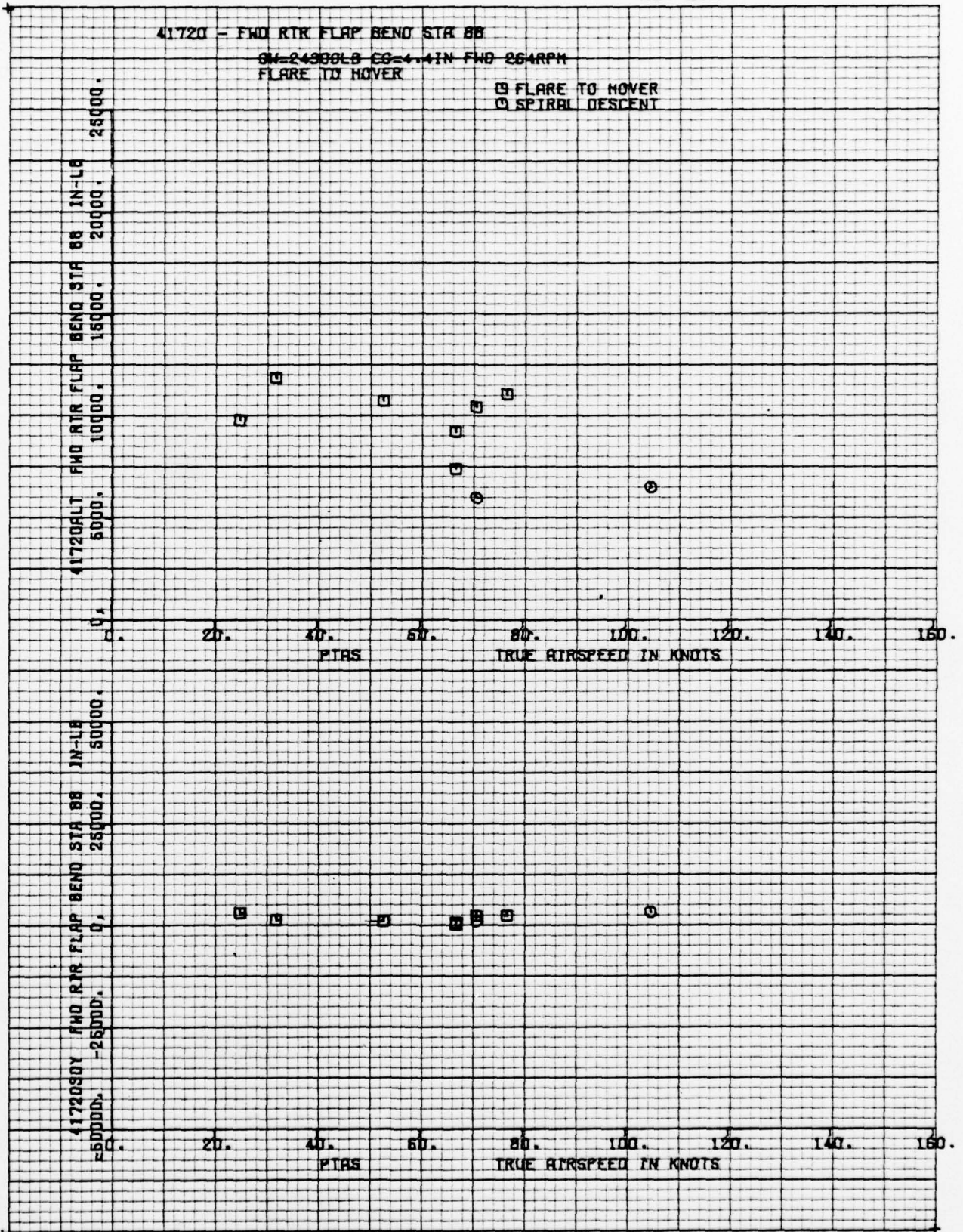
FORM 52300 (10/71)

THE **BOEING** COMPANY

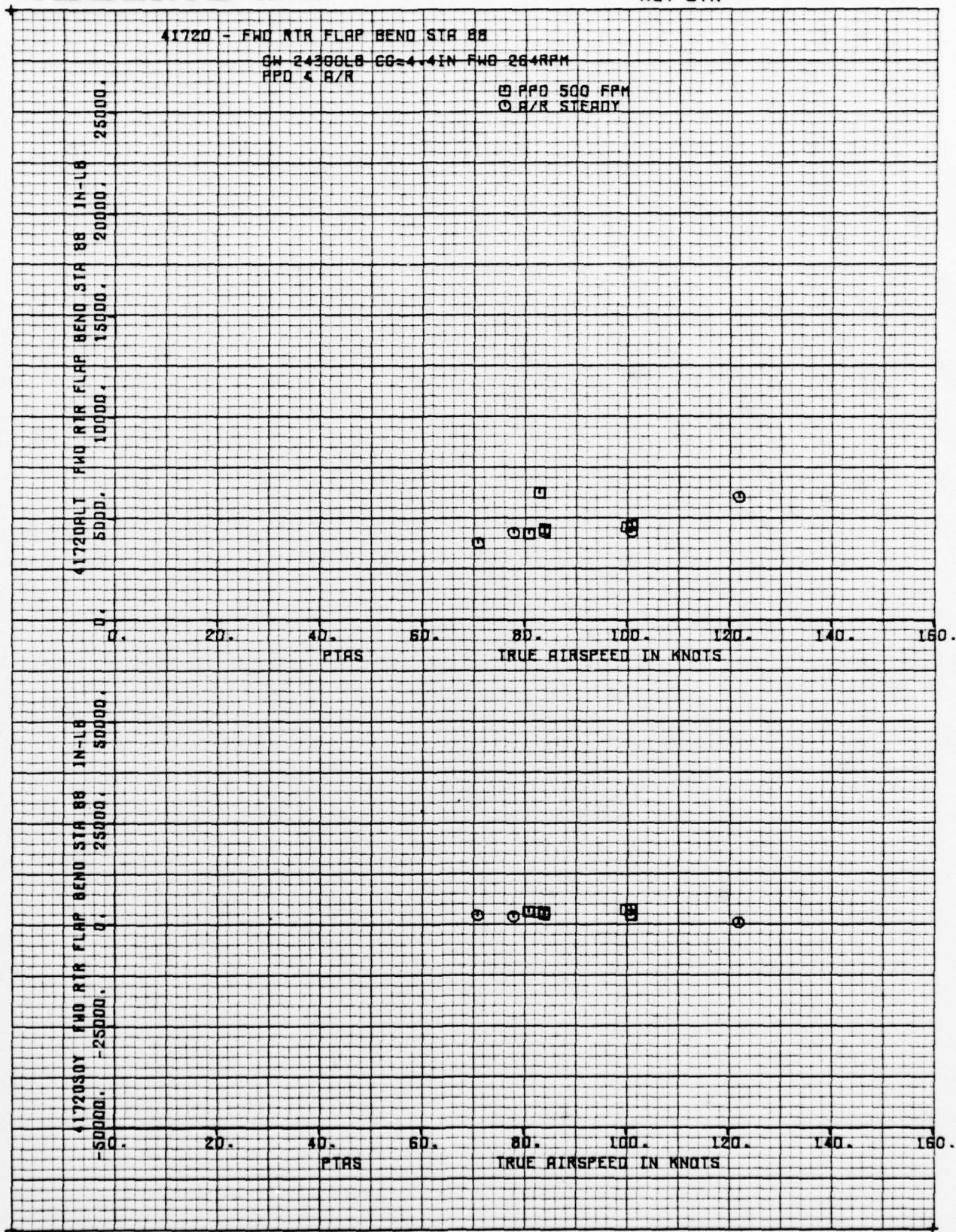
FORM 52300 (10/71)

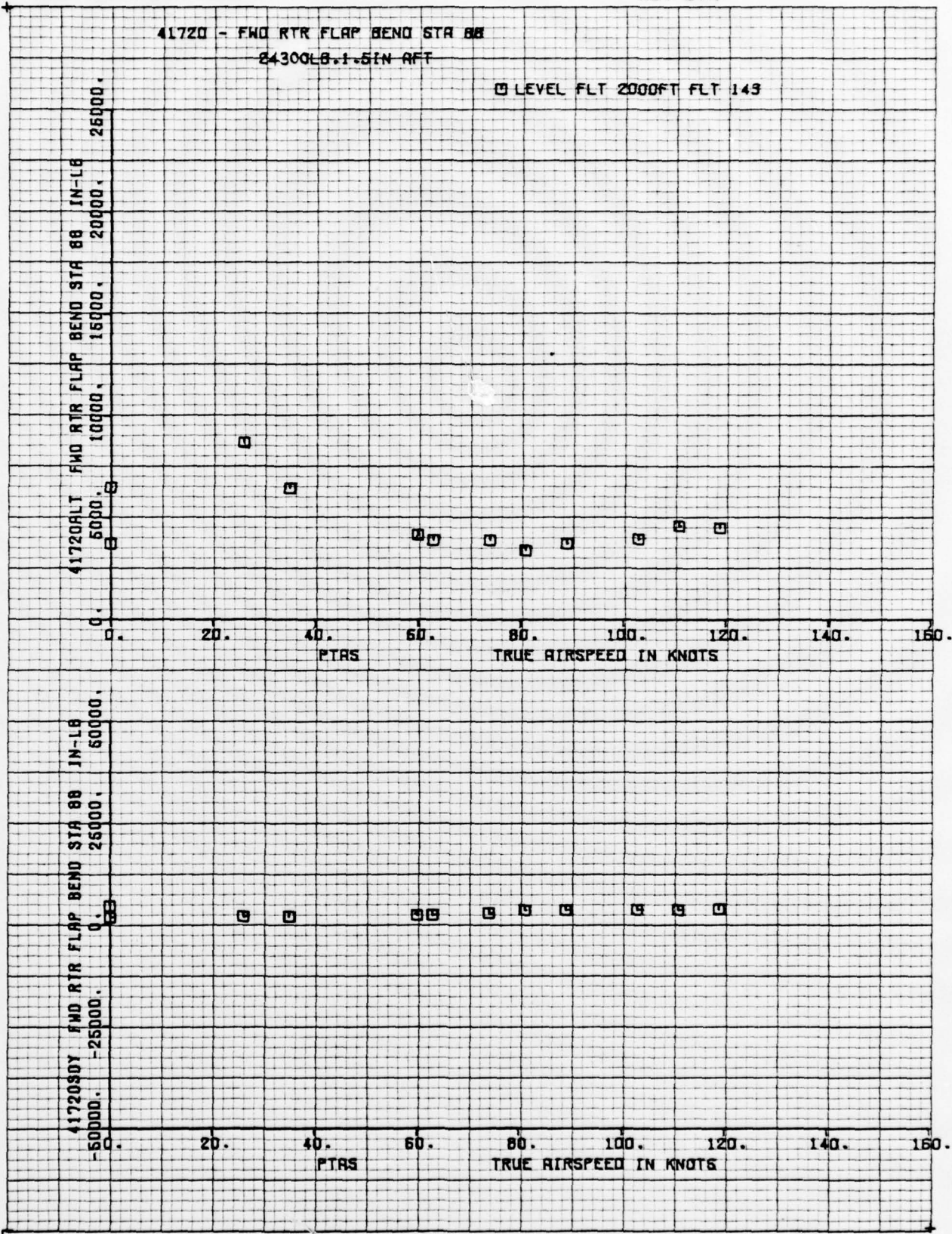
THE **BOEING** COMPANY

THE **BOEING** COMPANY



THE **BOEING** COMPANY





THE **BOEING** COMPANY

PREPARED BY: J. Bendo

CHECKED BY:

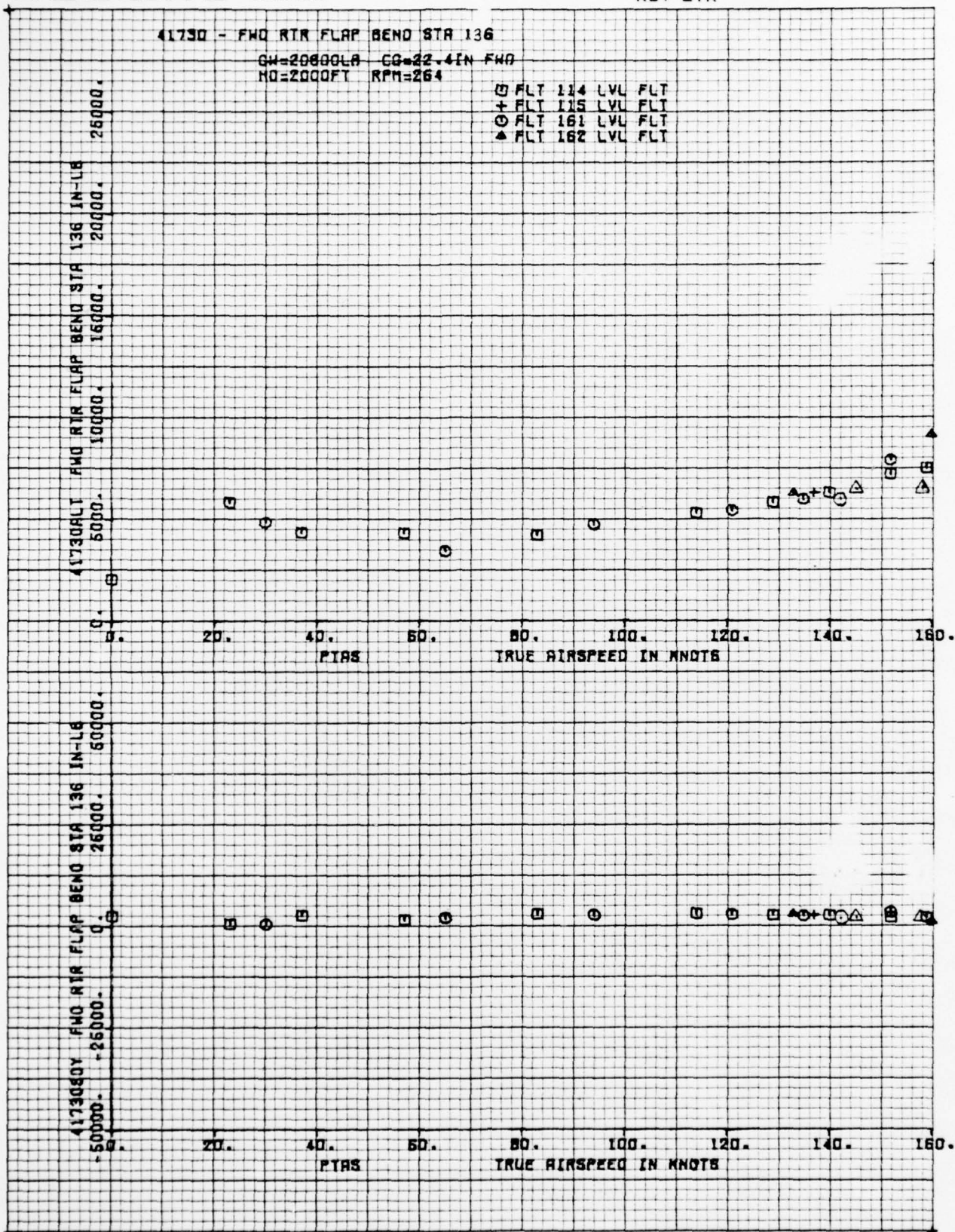
DATE: 8/28/78

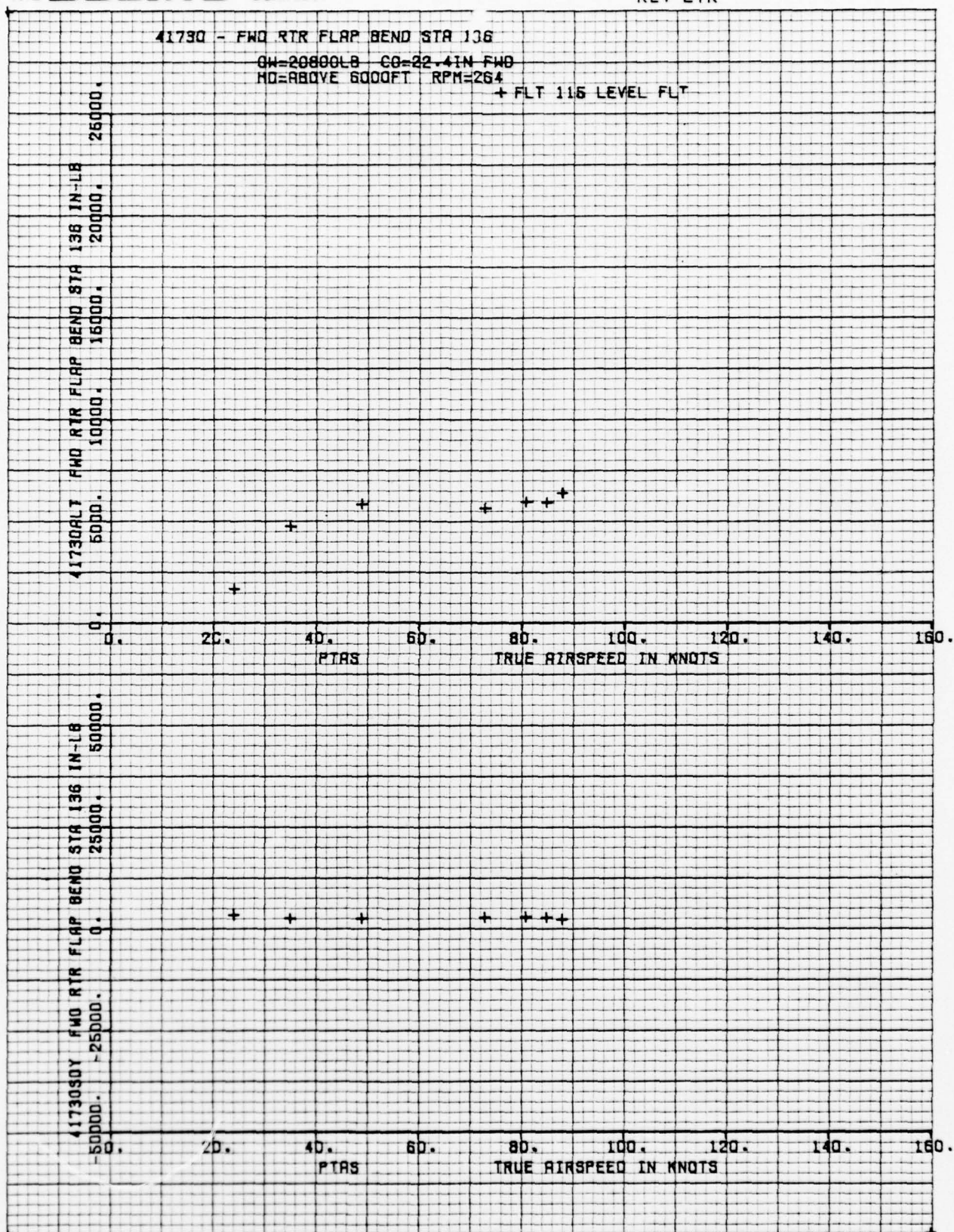
NUMBER D210-11168-3

REV LTR Volume 2

MODEL NO.

4.7 Forward Blade Flap Bending Station 136.



THE **BOEING** COMPANYNUMBER 1 VOLUME 2
REV LTR

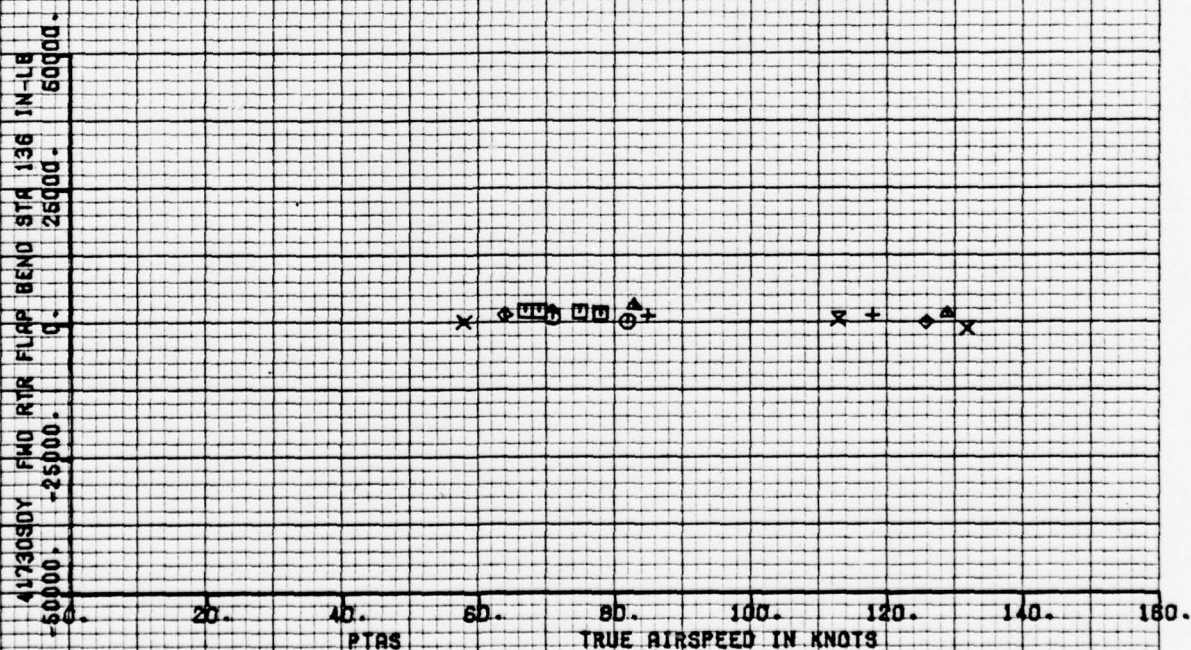
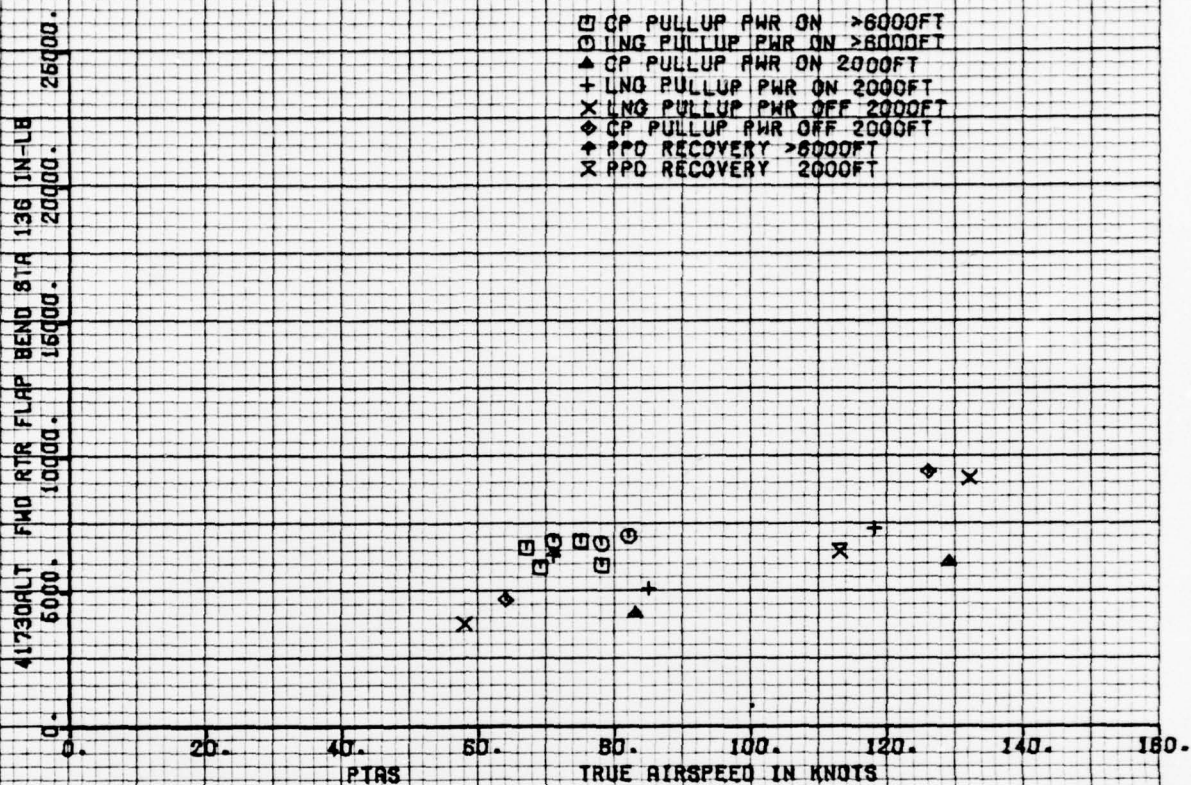
FORM 52300 (10/71)

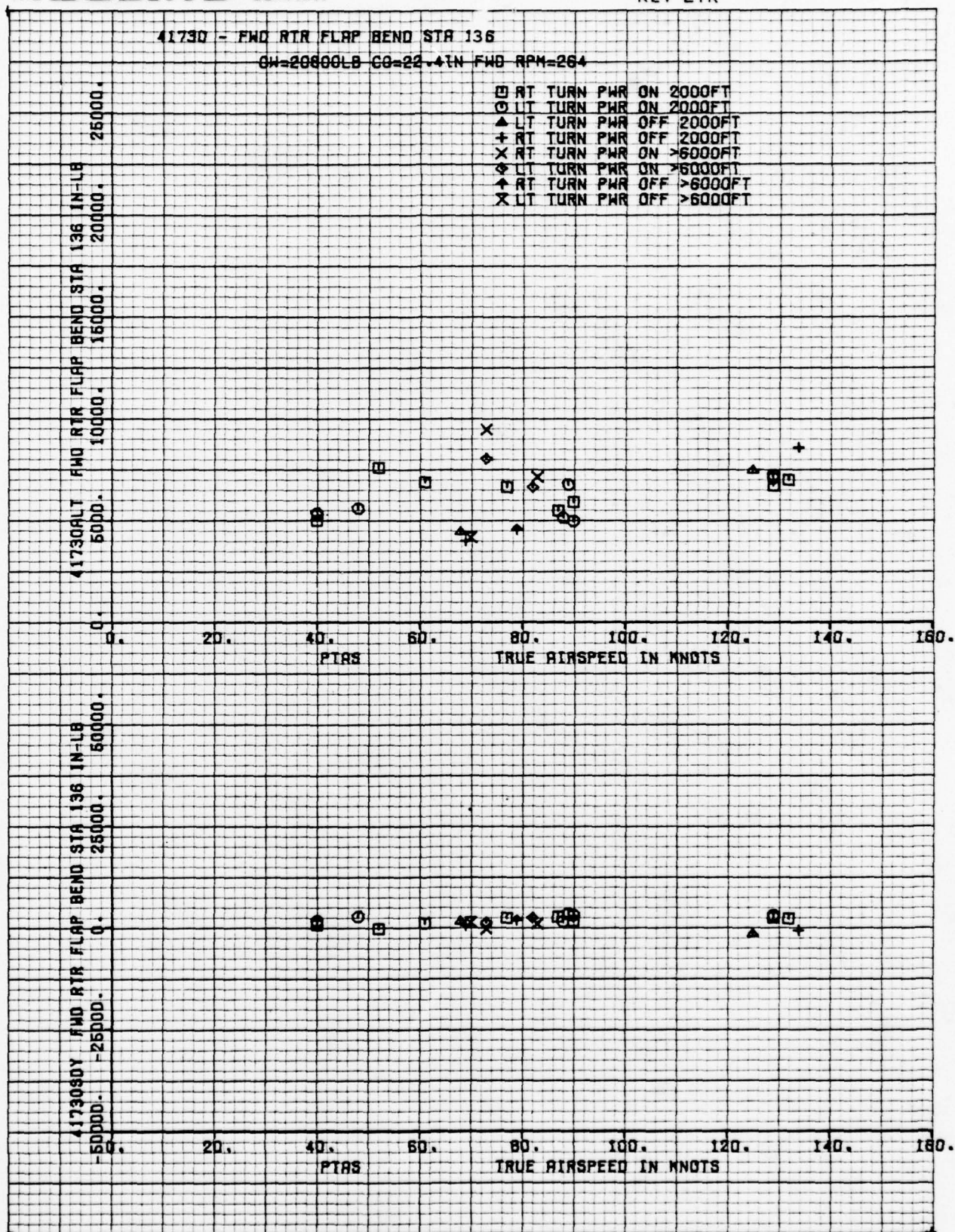
THE **BOEING** COMPANY

41730 - FWD RTR FLAP BEND STA 136

GN=20000LB CG=22.4IN FWD RPM=264

- CP PULLUP PWR ON >6000FT
- LNO PULLUP PWR ON >6000FT
- ▲ CP PULLUP PWR ON 2000FT
- + LNO PULLUP PWR ON 2000FT
- × LNO PULLUP PWR OFF 2000FT
- ◆ CP PULLUP PWR OFF 2000FT
- ♦ RPD RECOVERY >6000FT
- × RPD RECOVERY 2000FT



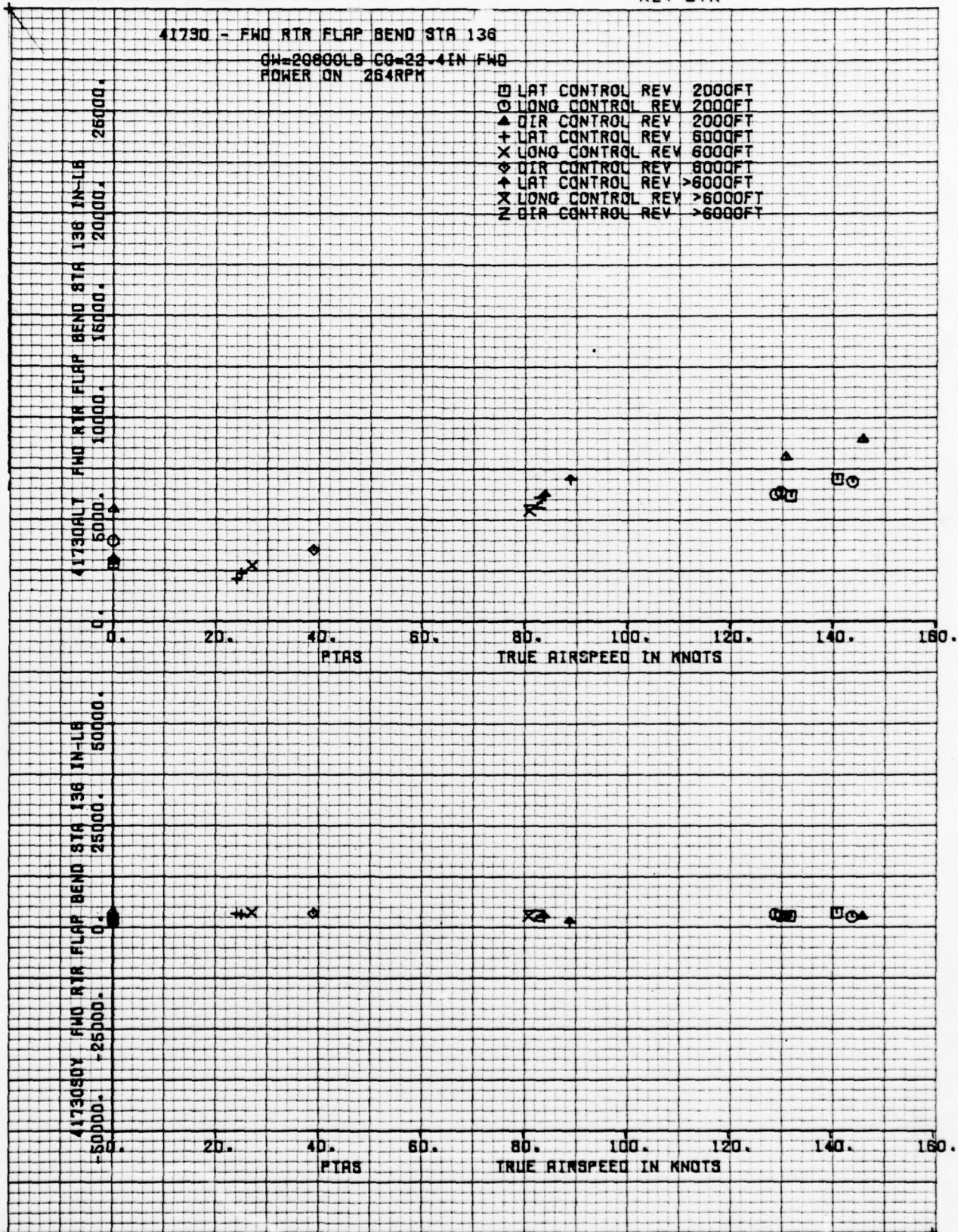


THE **BOEING** COMPANY

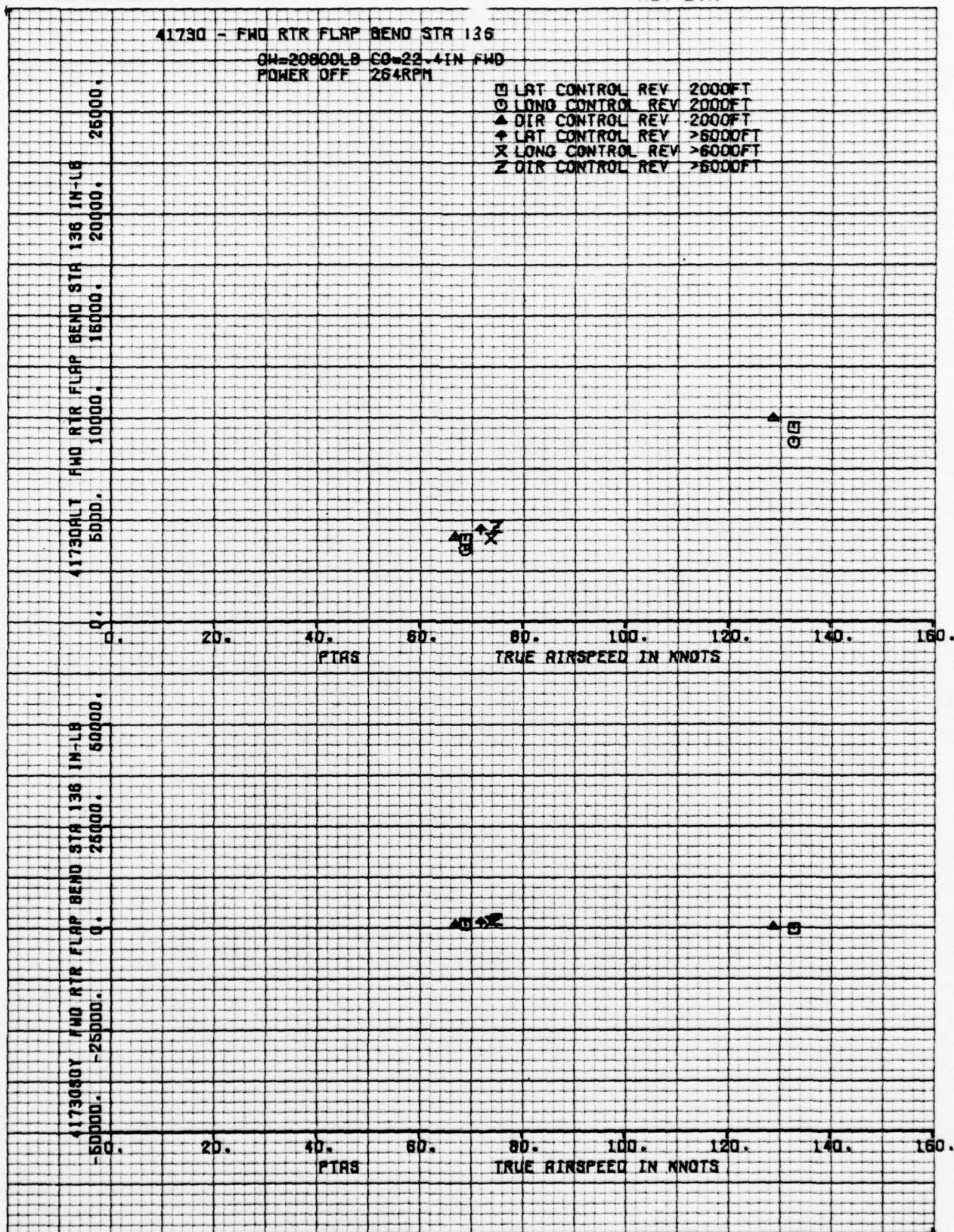
41730 - FWD RTR FLAP BEND STA 136

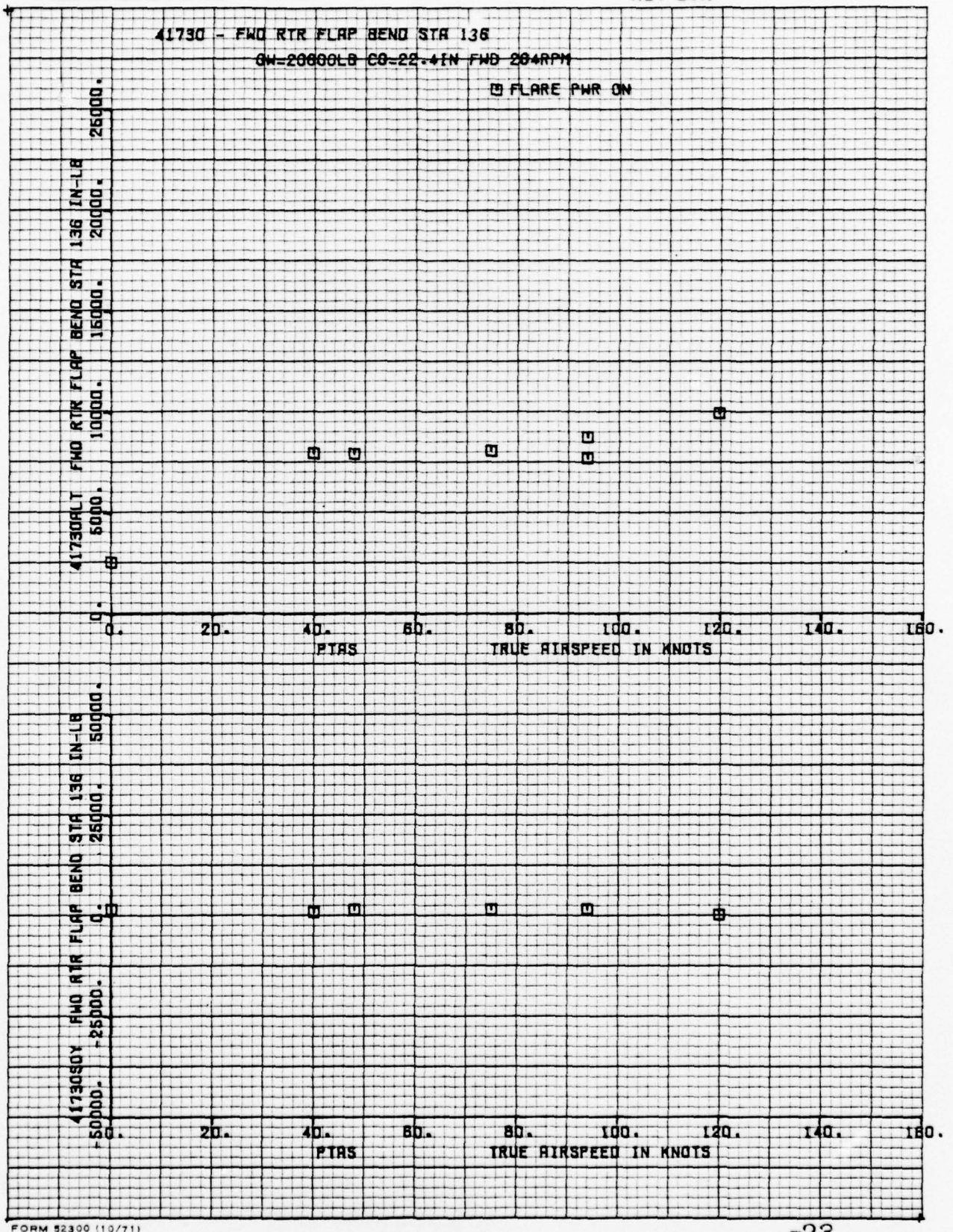
GW=20800LB CG=22.4IN FWD
POWER ON 264RPM

□ LAT CONTROL REV 2000FT
 ○ LONG CONTROL REV 2000FT
 ▲ DIR CONTROL REV 2000FT
 + LAT CONTROL REV 6000FT
 X LONG CONTROL REV 6000FT
 ◇ DIR CONTROL REV 8000FT
 △ LAT CONTROL REV >6000FT
 X LONG CONTROL REV >6000FT
 Z DIR CONTROL REV >6000FT



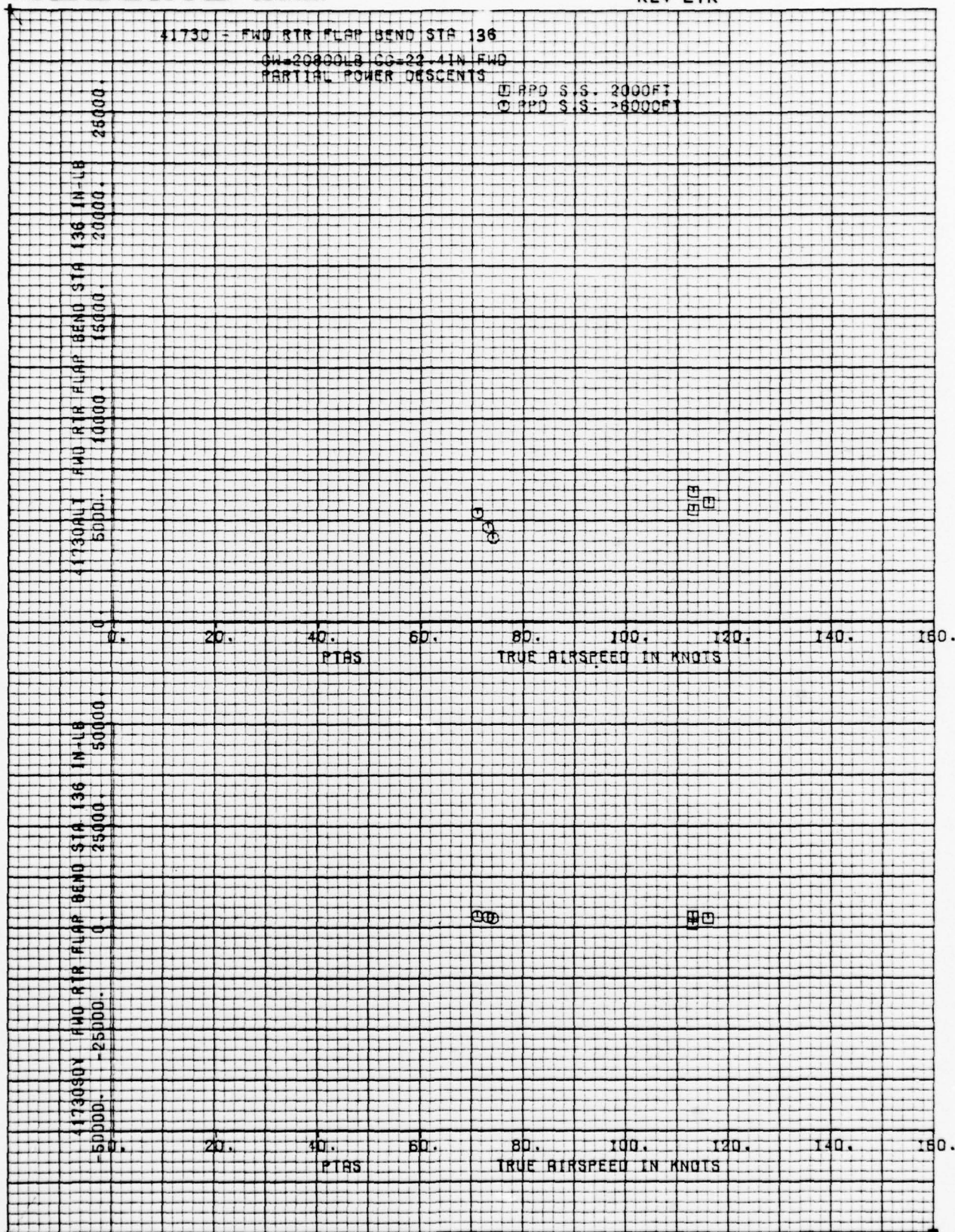
FORM 52300 (10/71)



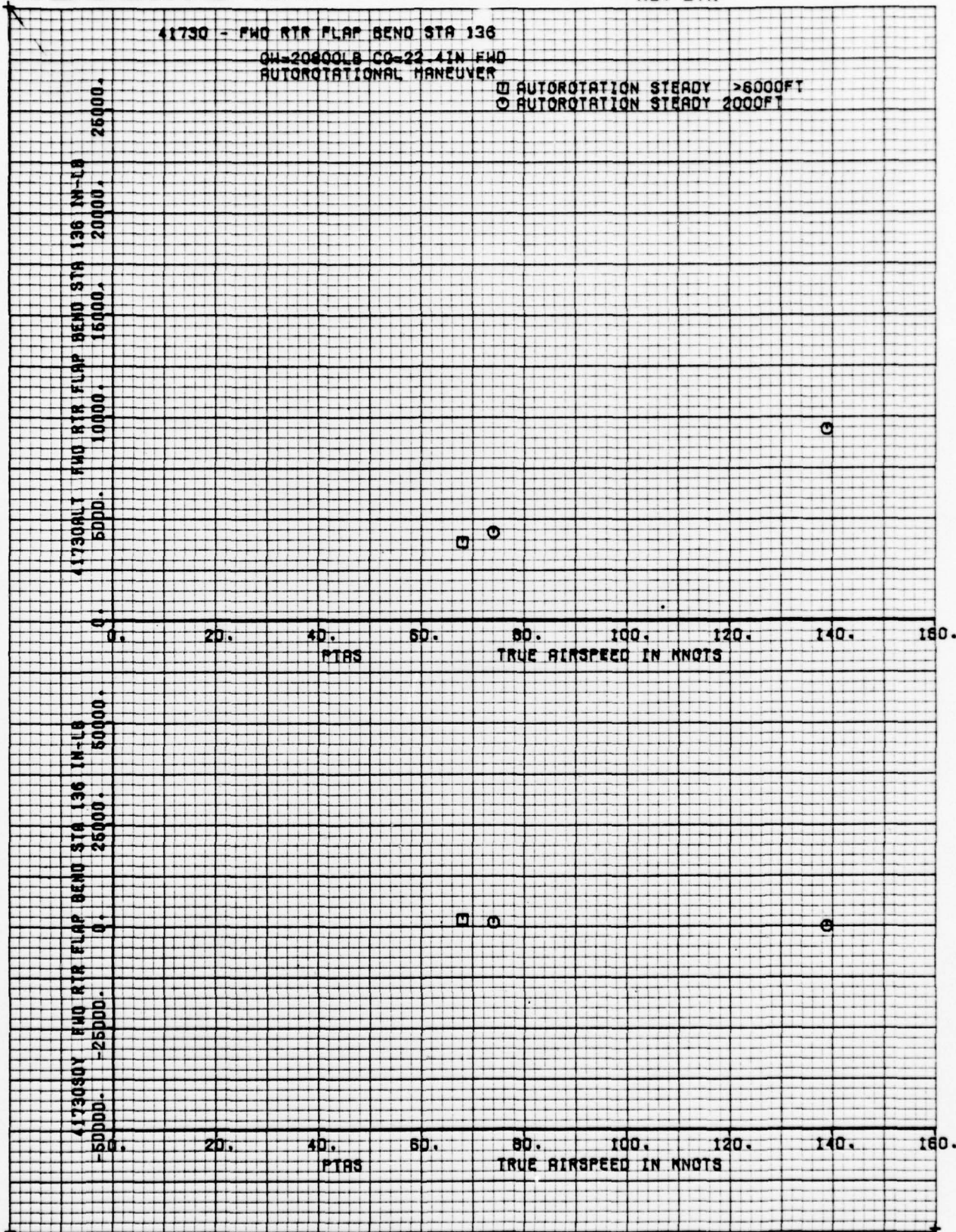
THE **BOEING** COMPANY

FORM 52300 (10/71)

THE **BOEING** COMPANY



FORM 52300 (10/71)



41730 - FWD RTR FLAP BEND STA 136

SW=28809LB CG=9.7IN AFT
HO=2000FT RPM=284

□ FLT 126 LEVEL FLT
○ FLT 128 LEVEL FLT
▲ FLT 136 LEVEL FLT
+ FLT 138 LEVEL FLT
X FLT 151 LEVEL FLT
◇ FLT 166 LEVEL FLIGHT
↑ FLT 177 LEVEL FLT
X FLT 122 LEVEL FLT
N FLT 124 LEVEL FLT

41730ALT FWD RTR FLAP BEND STA 136 IN-LB
25000.
20000.
15000.
10000.
5000.
0.

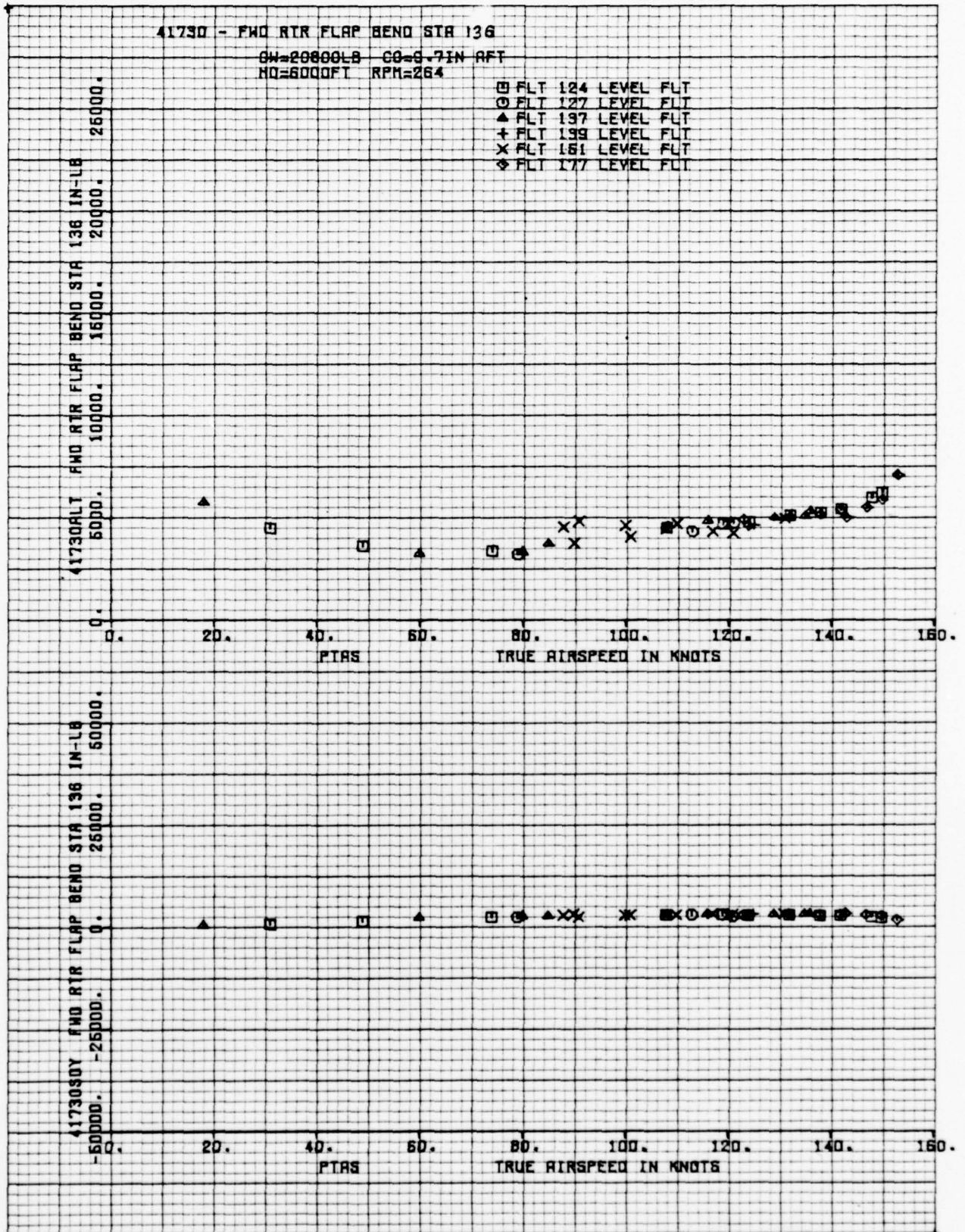
PTAS 20. 40. 60. 80. 100. 120. 140. 160.

TRUE AIRSPEED IN KNOTS

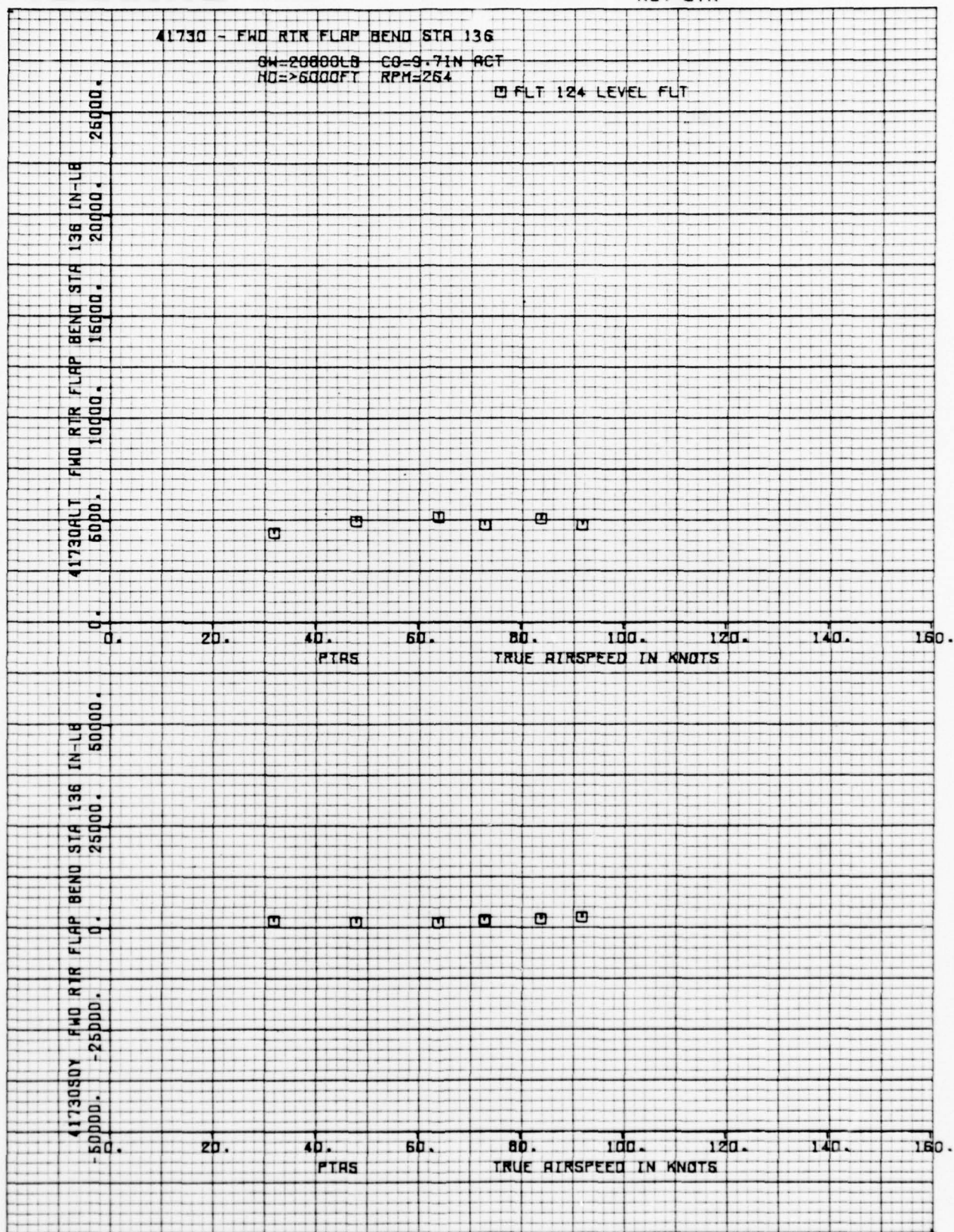
41730SDY FWD RTR FLAP BEND STA 136 IN-LB
50000.
25000.
0.
-25000.

PTAS 20. 40. 60. 80. 100. 120. 140. 160.

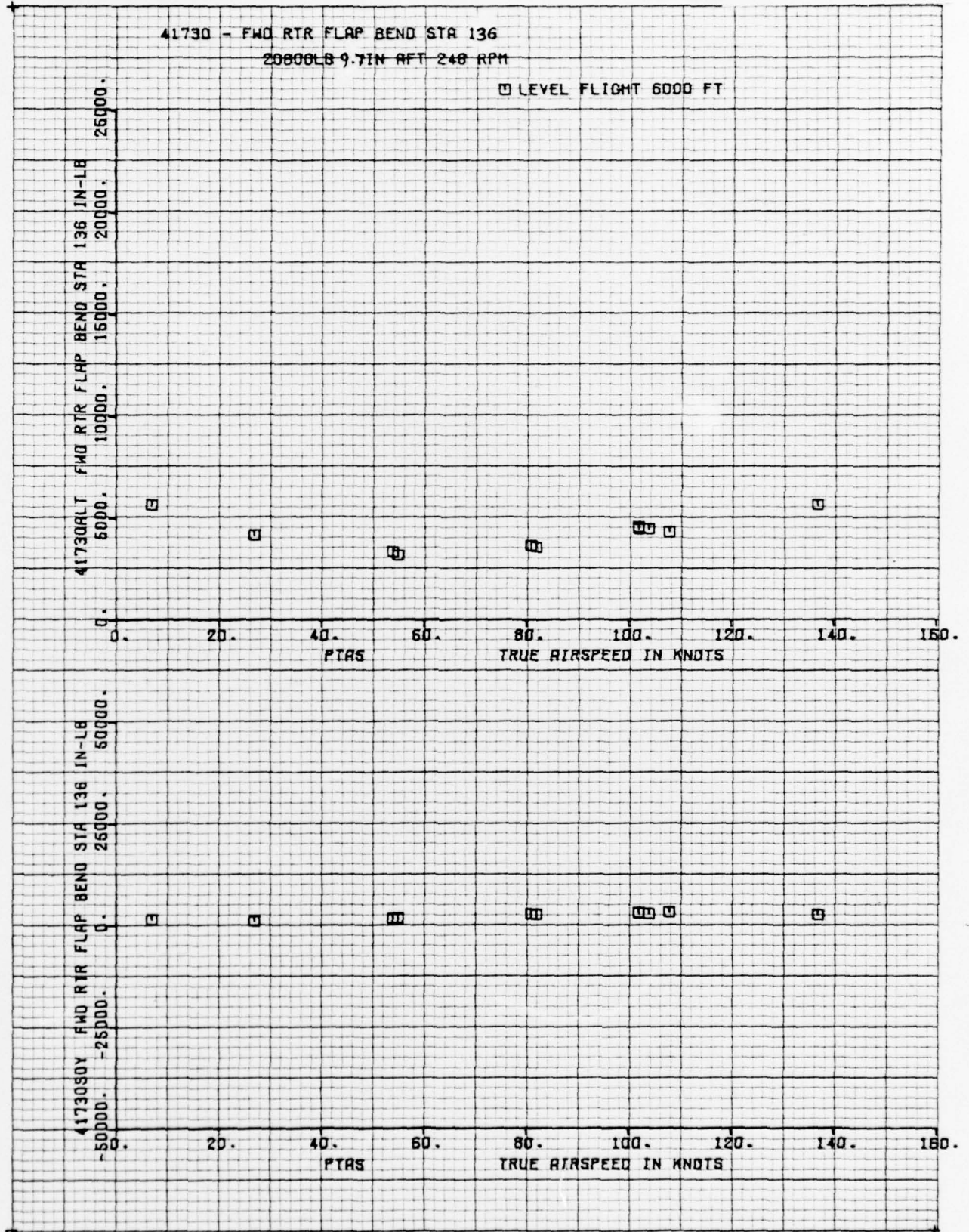
TRUE AIRSPEED IN KNOTS

THE **BOEING** COMPANY

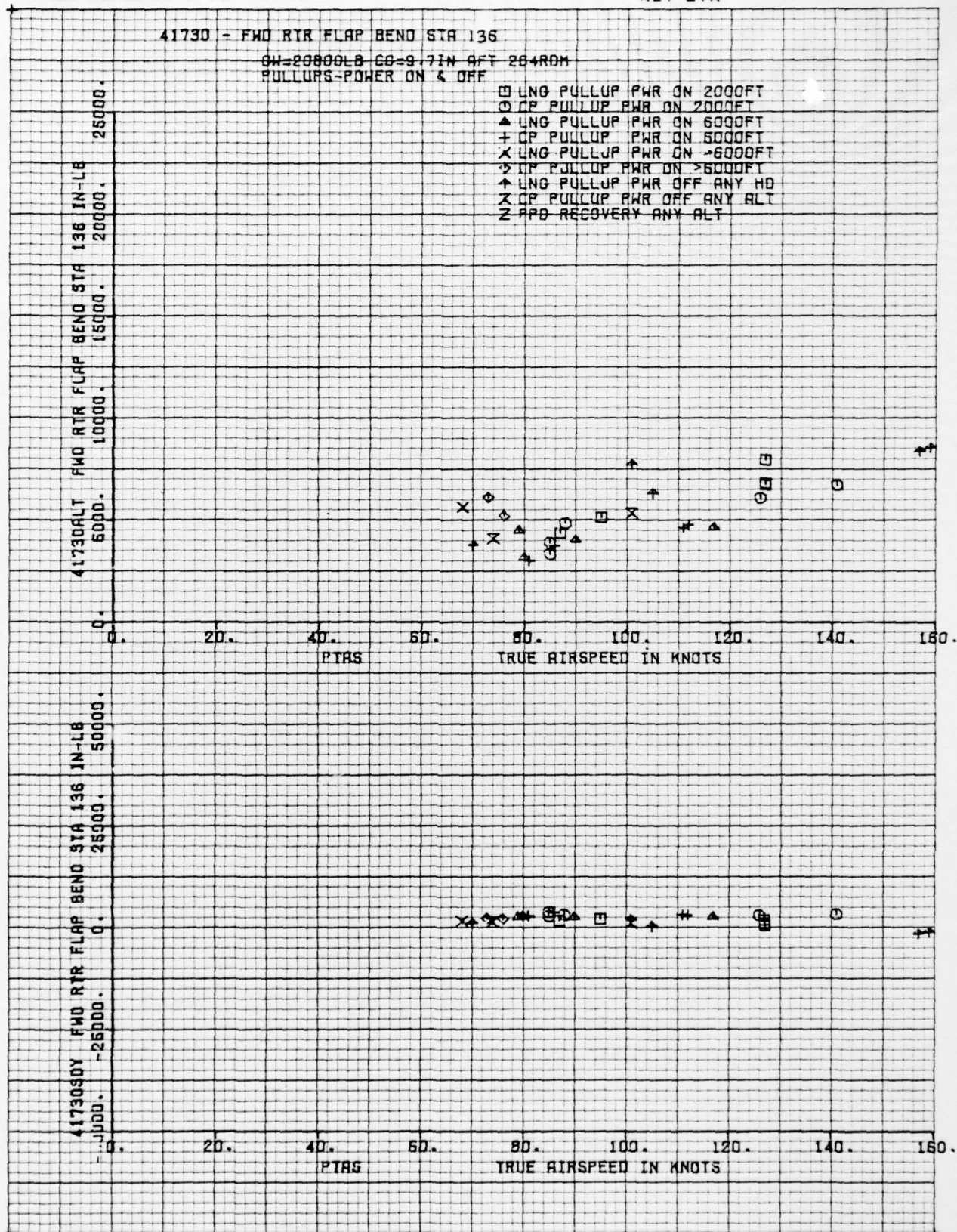
FORM 52300 (10/71)



THE **BOEING** COMPANY



FORM 52300 (10/71)

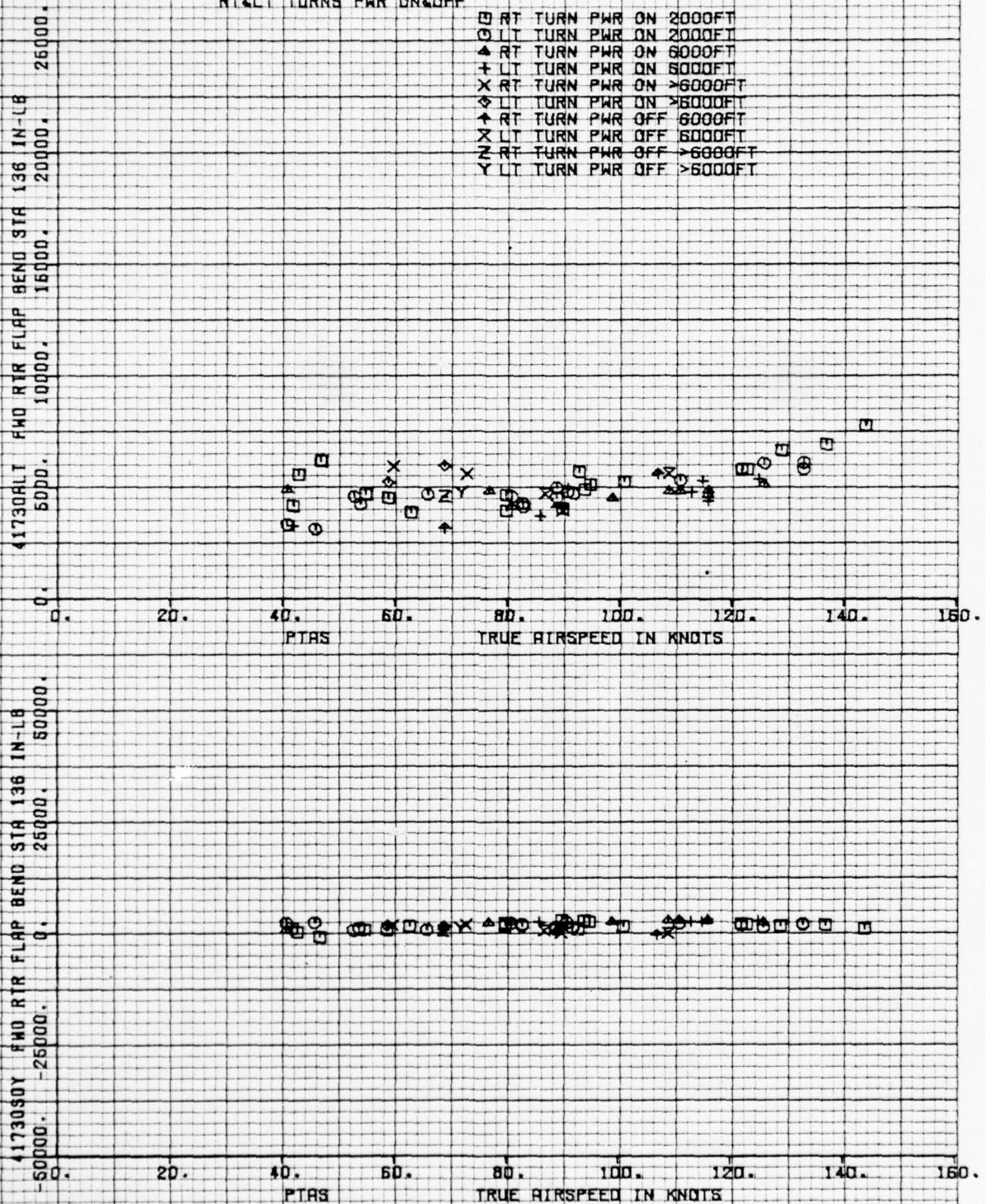


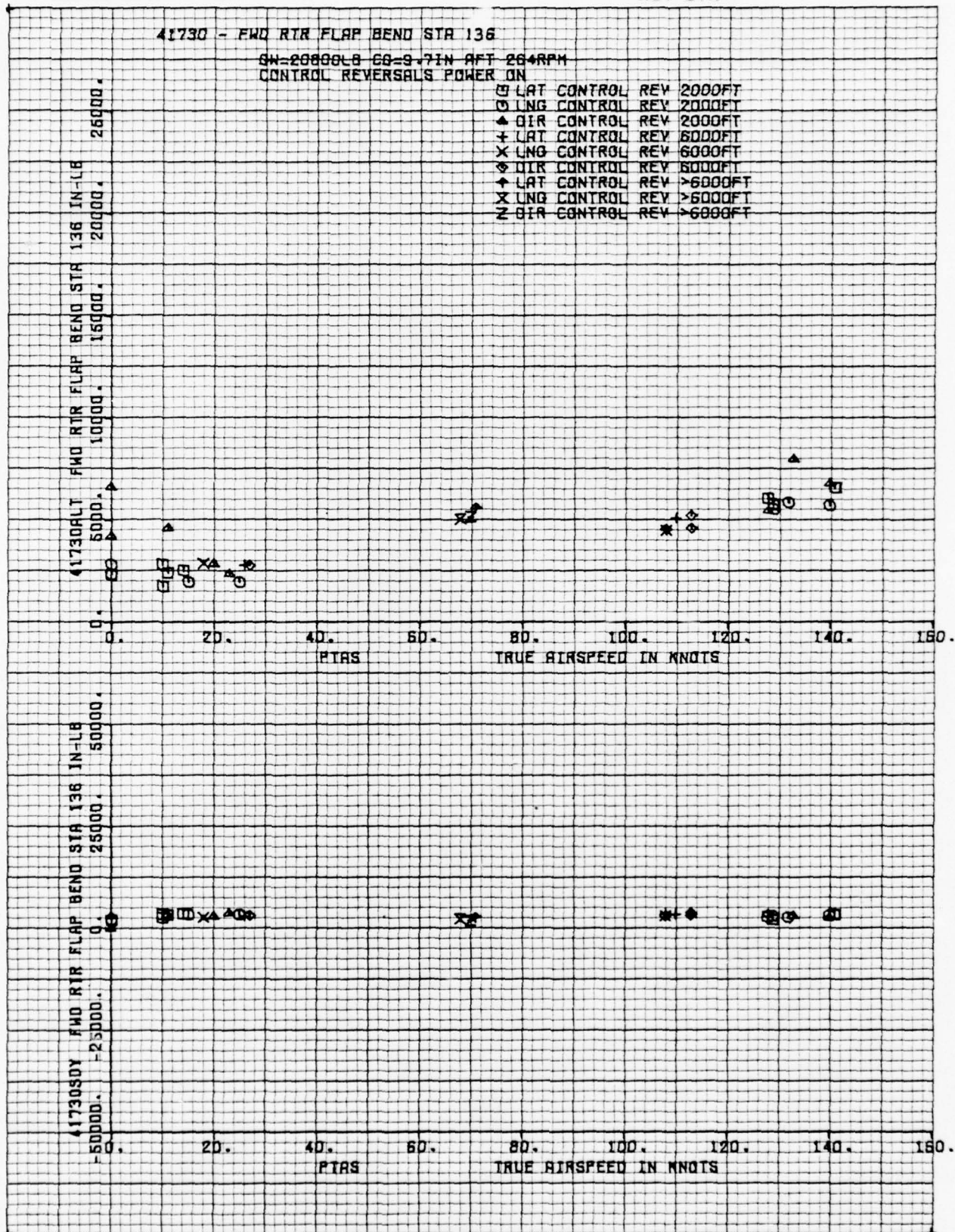
THE **BOEING** COMPANY

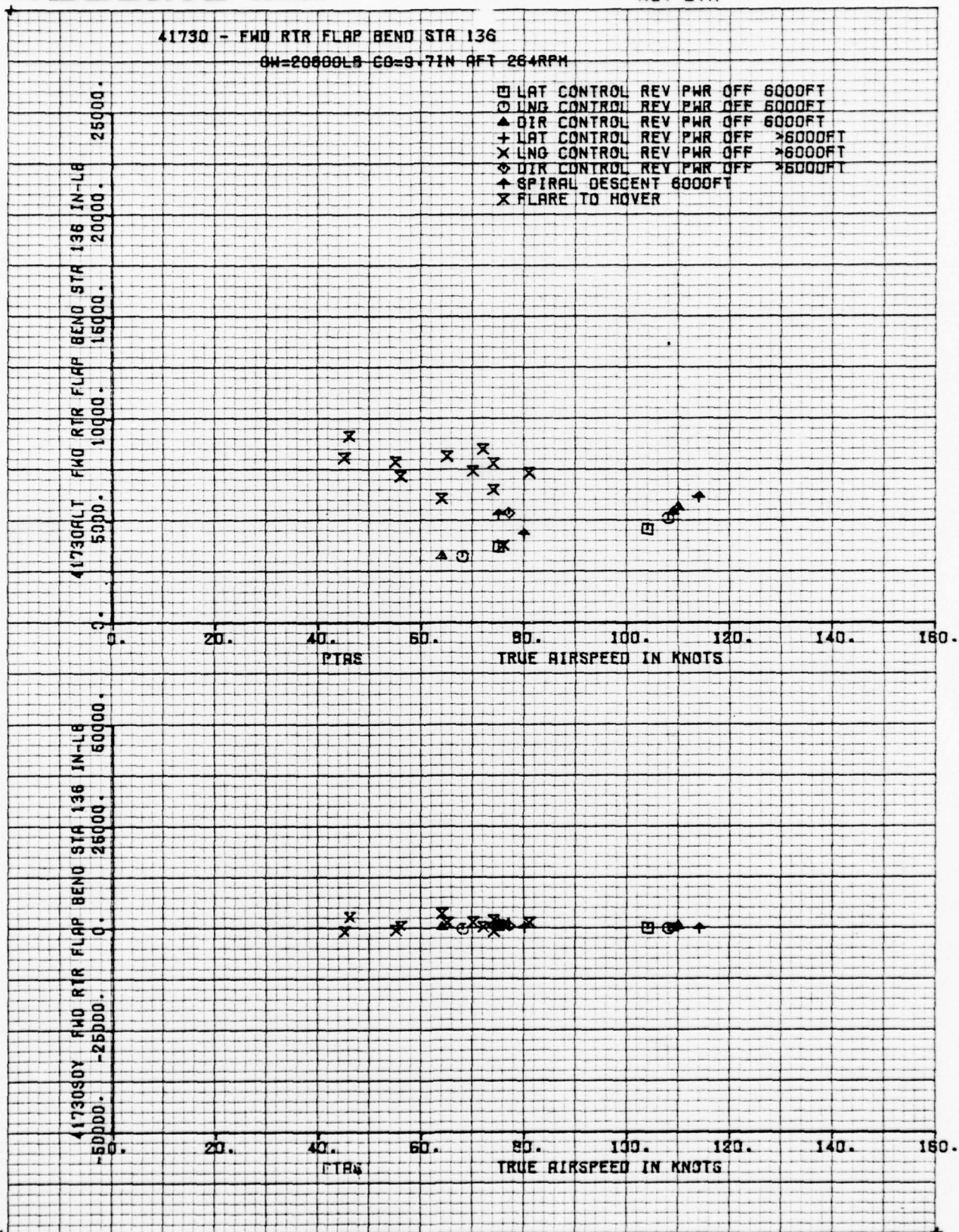
41730 - FWD RTR FLAP BEND STA 136

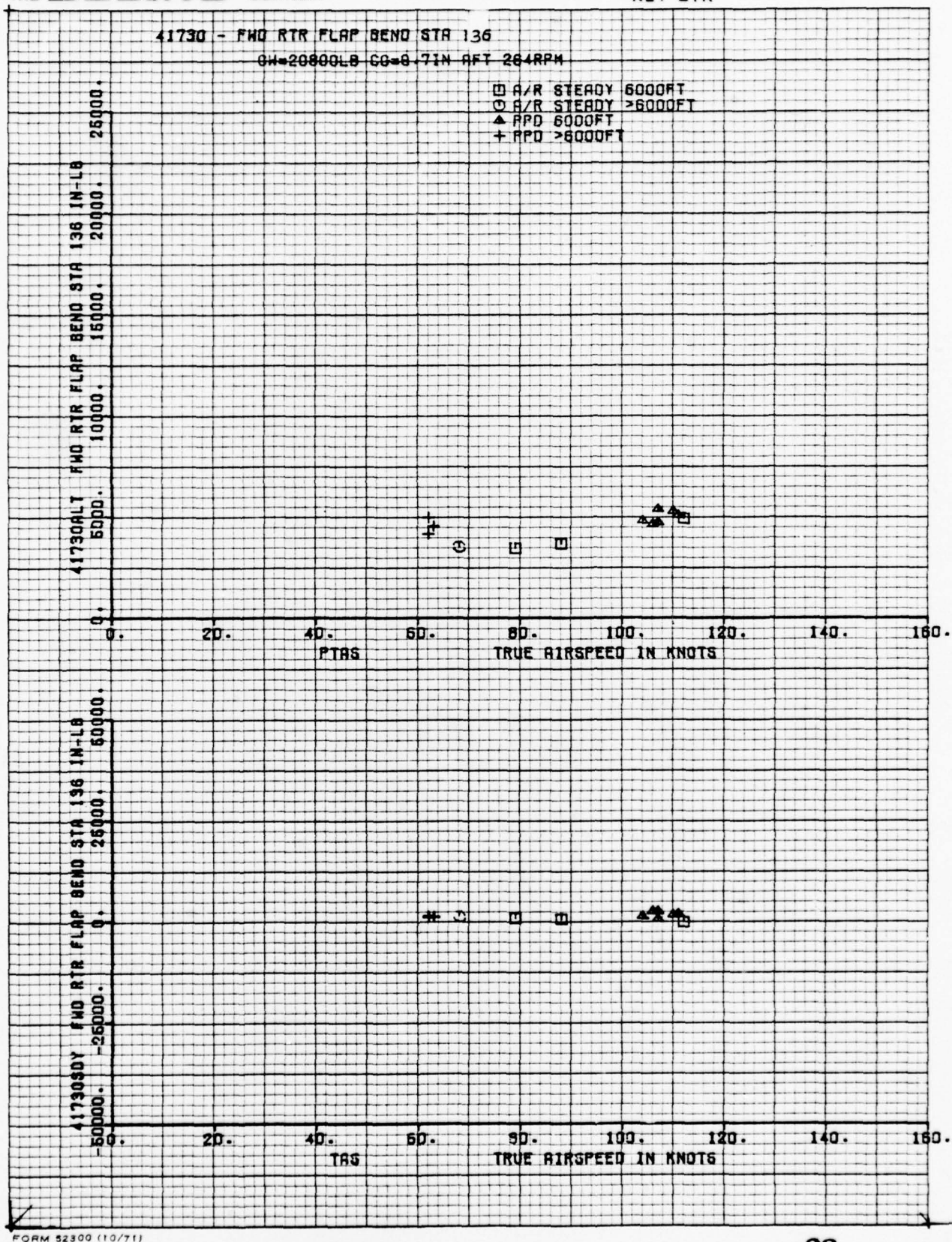
GW=20800LB CG=9.7IN AFT 264RPM
RT< TURNS PWR ON&OFF

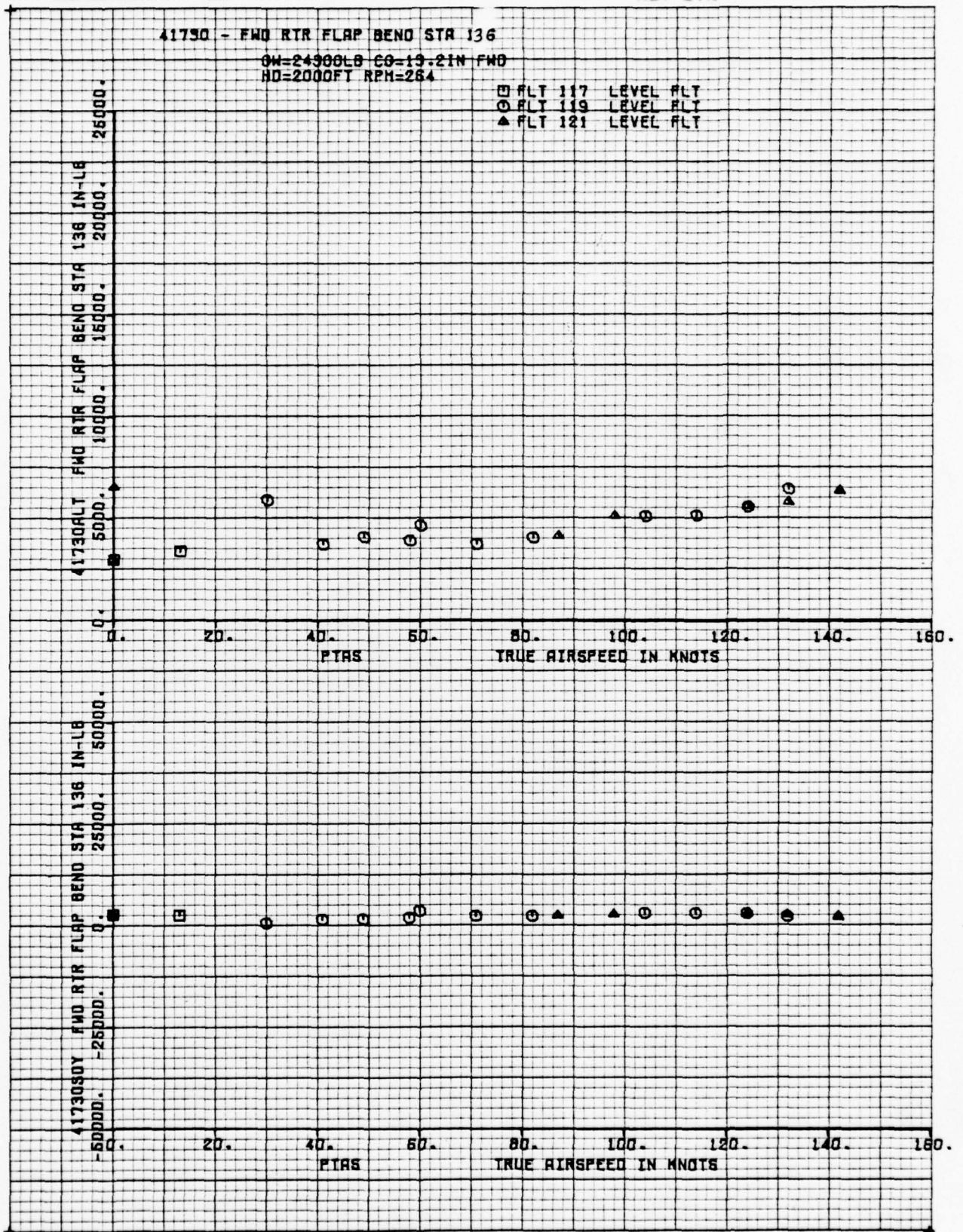
□ RT TURN PWR ON 2000FT
 ○ LT TURN PWR ON 2000FT
 ▲ RT TURN PWR ON 6000FT
 + LT TURN PWR ON 6000FT
 X RT TURN PWR ON >6000FT
 ◆ LT TURN PWR ON >6000FT
 ↑ RT TURN PWR OFF 6000FT
 X LT TURN PWR OFF 6000FT
 Z RT TURN PWR OFF >6000FT
 Y LT TURN PWR OFF >6000FT





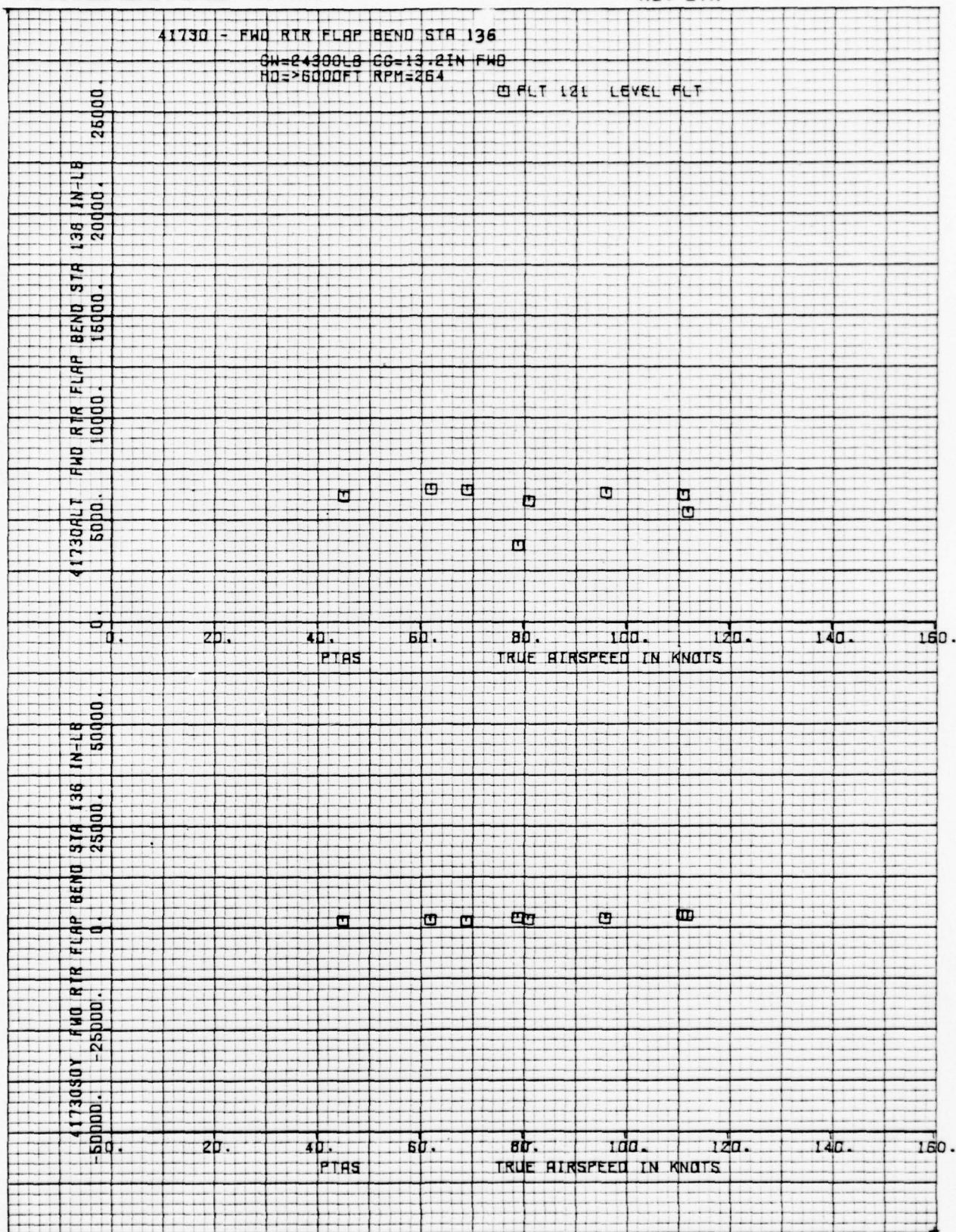
THE **BOEING** COMPANY

THE **BOEING** COMPANY

THE **BOEING** COMPANY

FORM 52300 (10/71)

THE **BOEING** COMPANY



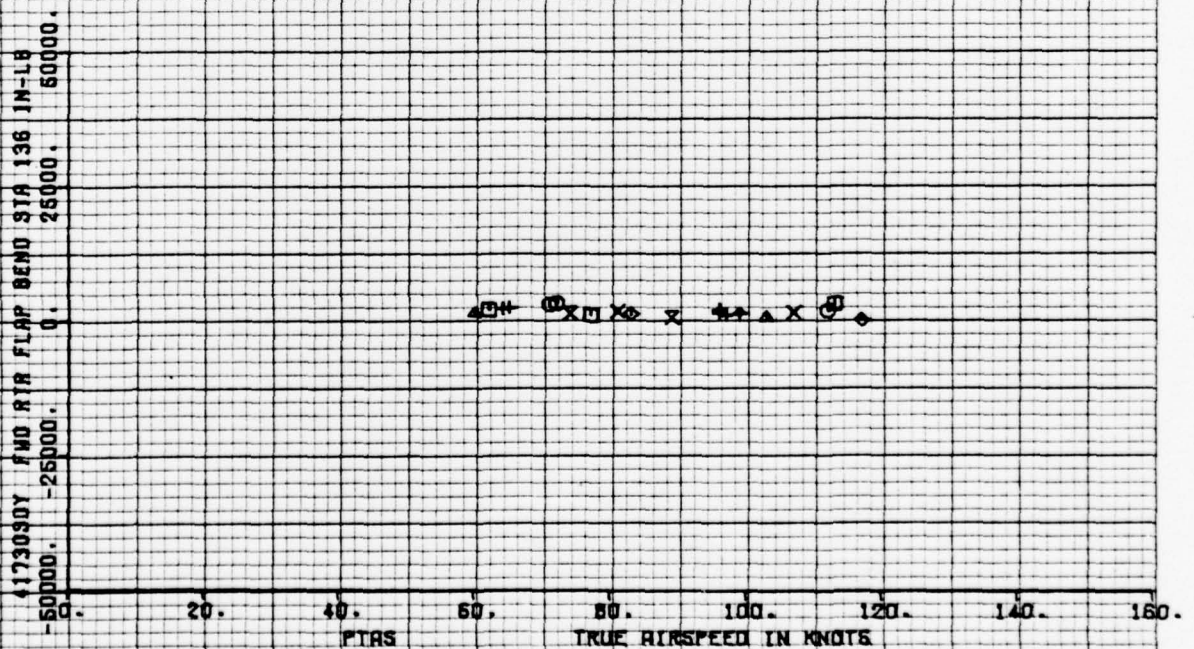
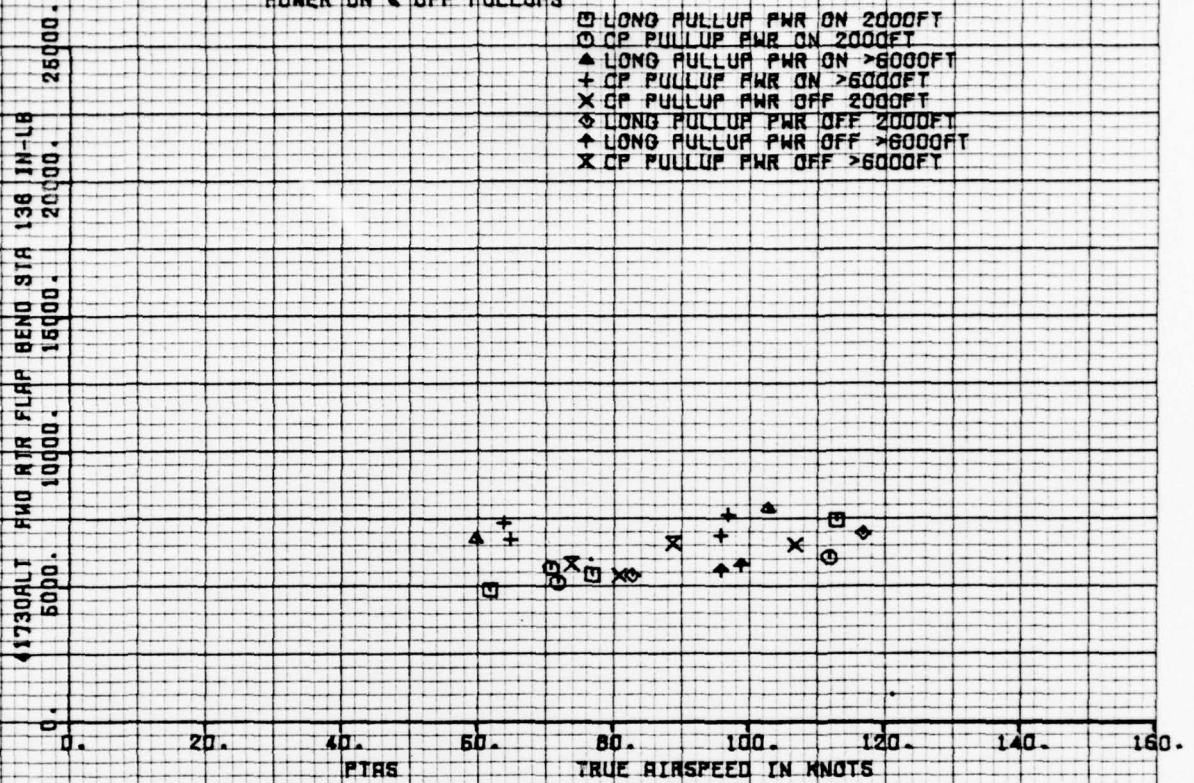
FORM 52300 (10/71)

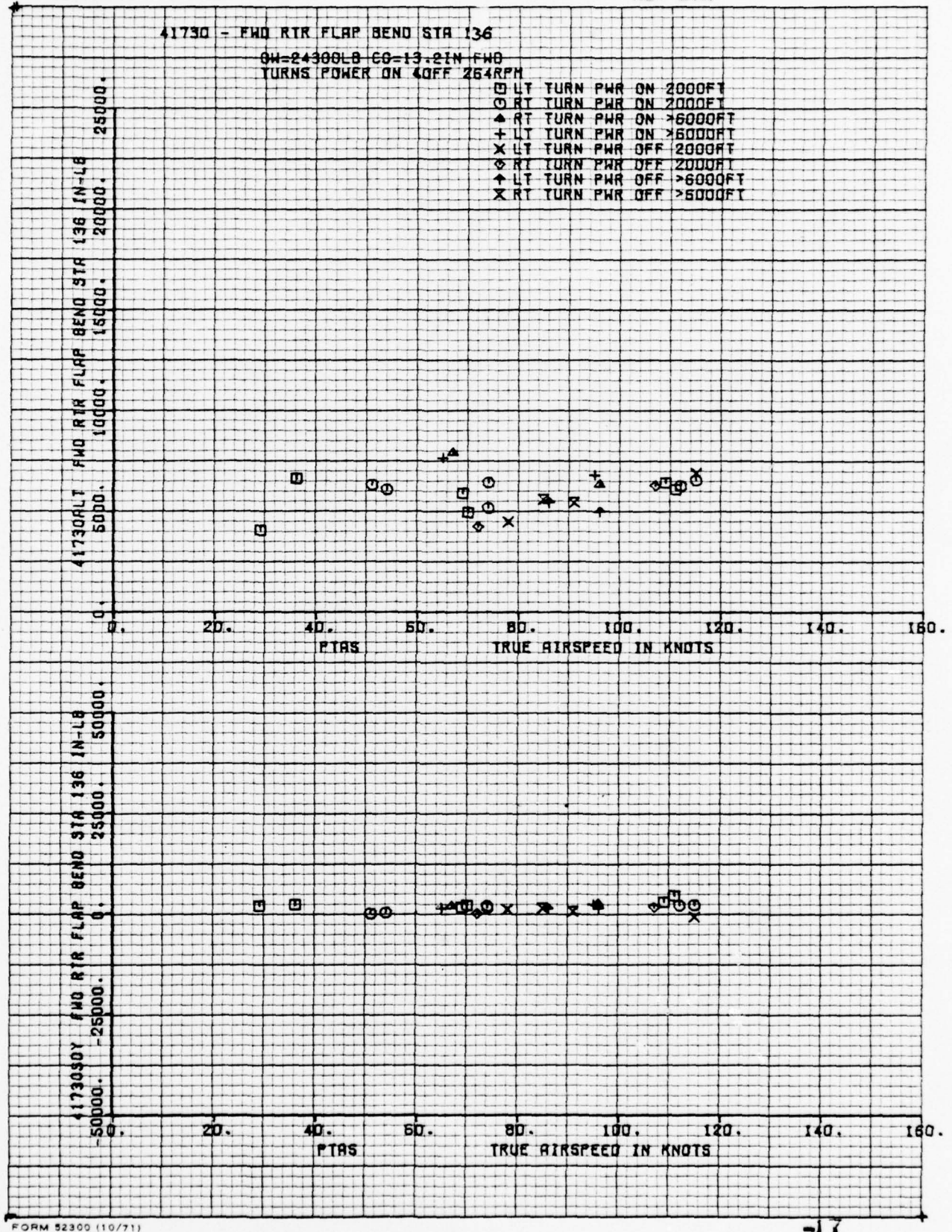
THE **BOEING** COMPANY

41730 - FWD RTR FLAP BEND STA 136

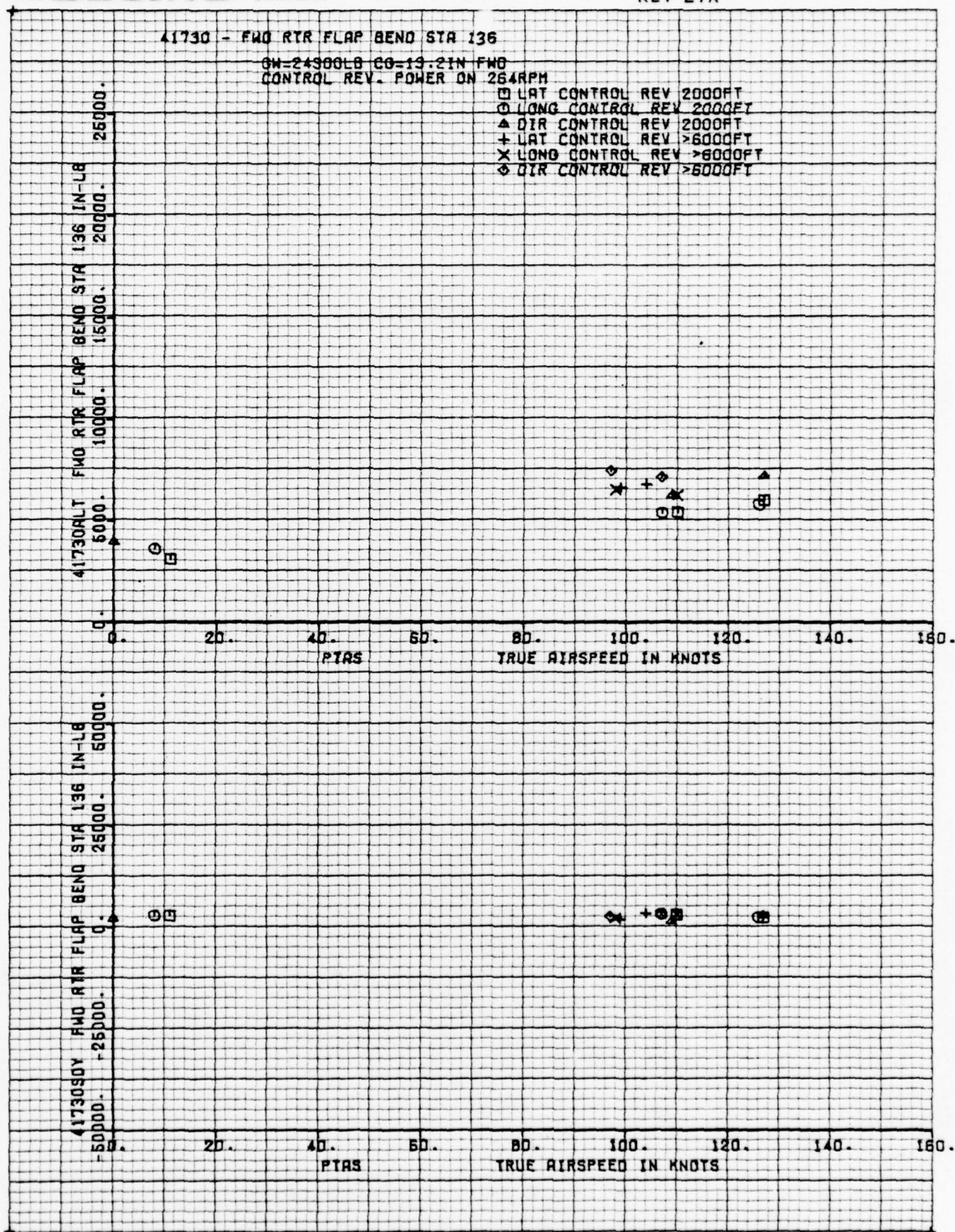
ON-24300LB GS-13.2IN FWD
POWER ON & OFF PULLUPS

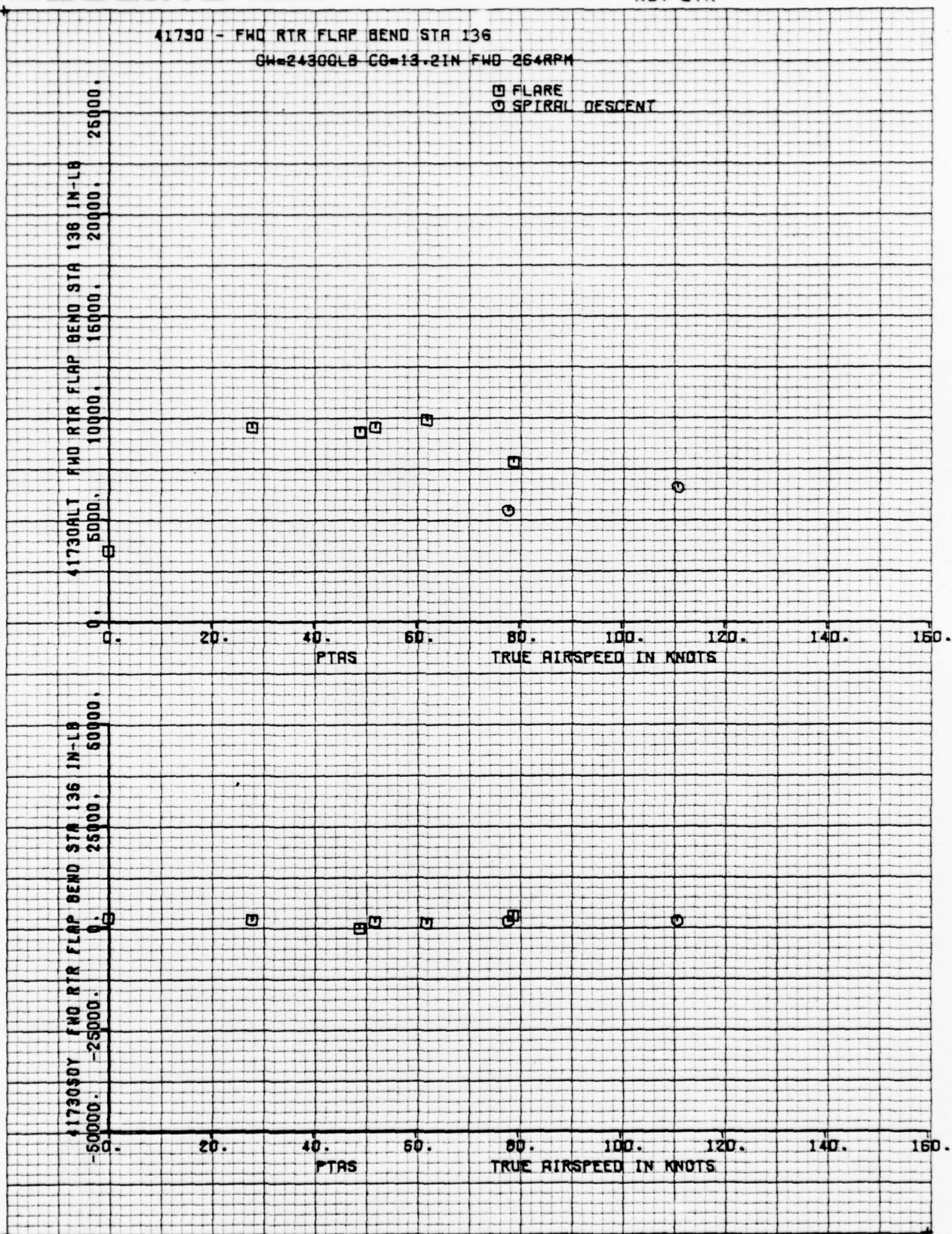
- LONG PULLUP PWR ON 2000FT
- CP PULLUP PWR ON 2000FT
- ▲ LONG PULLUP PWR ON >6000FT
- + CP PULLUP PWR ON >6000FT
- × CP PULLUP PWR OFF 2000FT
- ◇ LONG PULLUP PWR OFF 2000FT
- ↑ LONG PULLUP PWR OFF >6000FT
- × CP PULLUP PWR OFF >6000FT



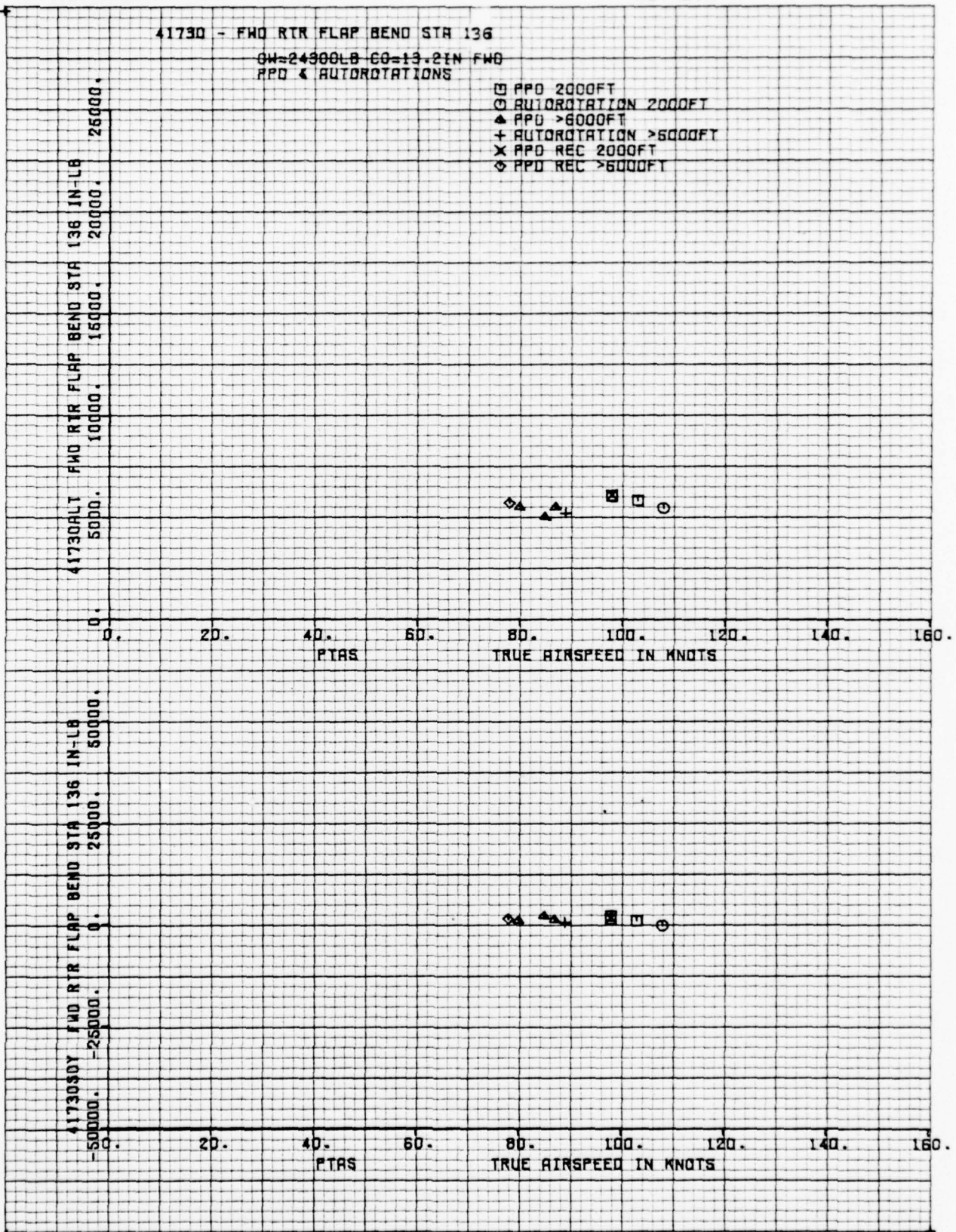
THE **BOEING** COMPANY

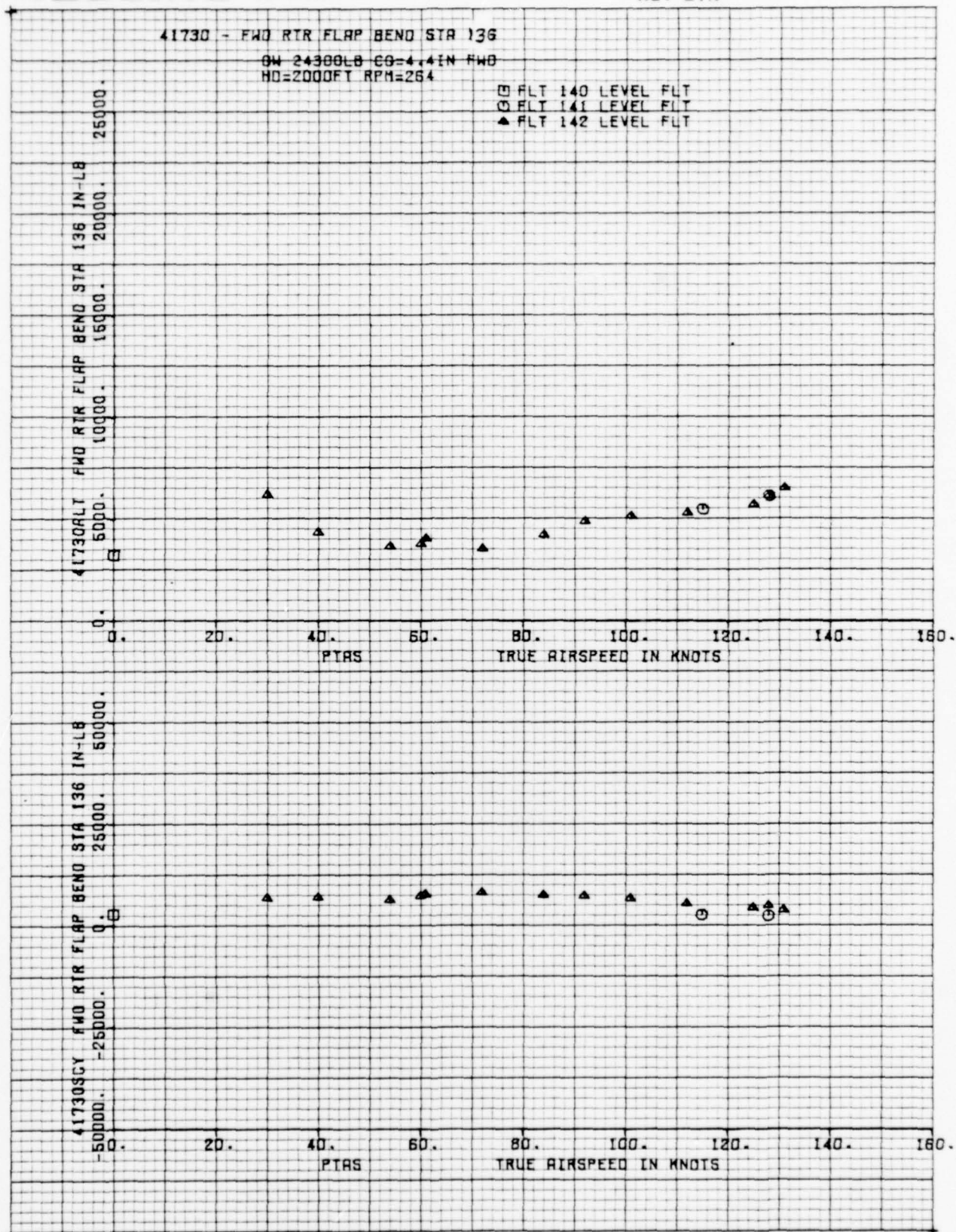
THE **BOEING** COMPANY





THE **BOEING** COMPANY





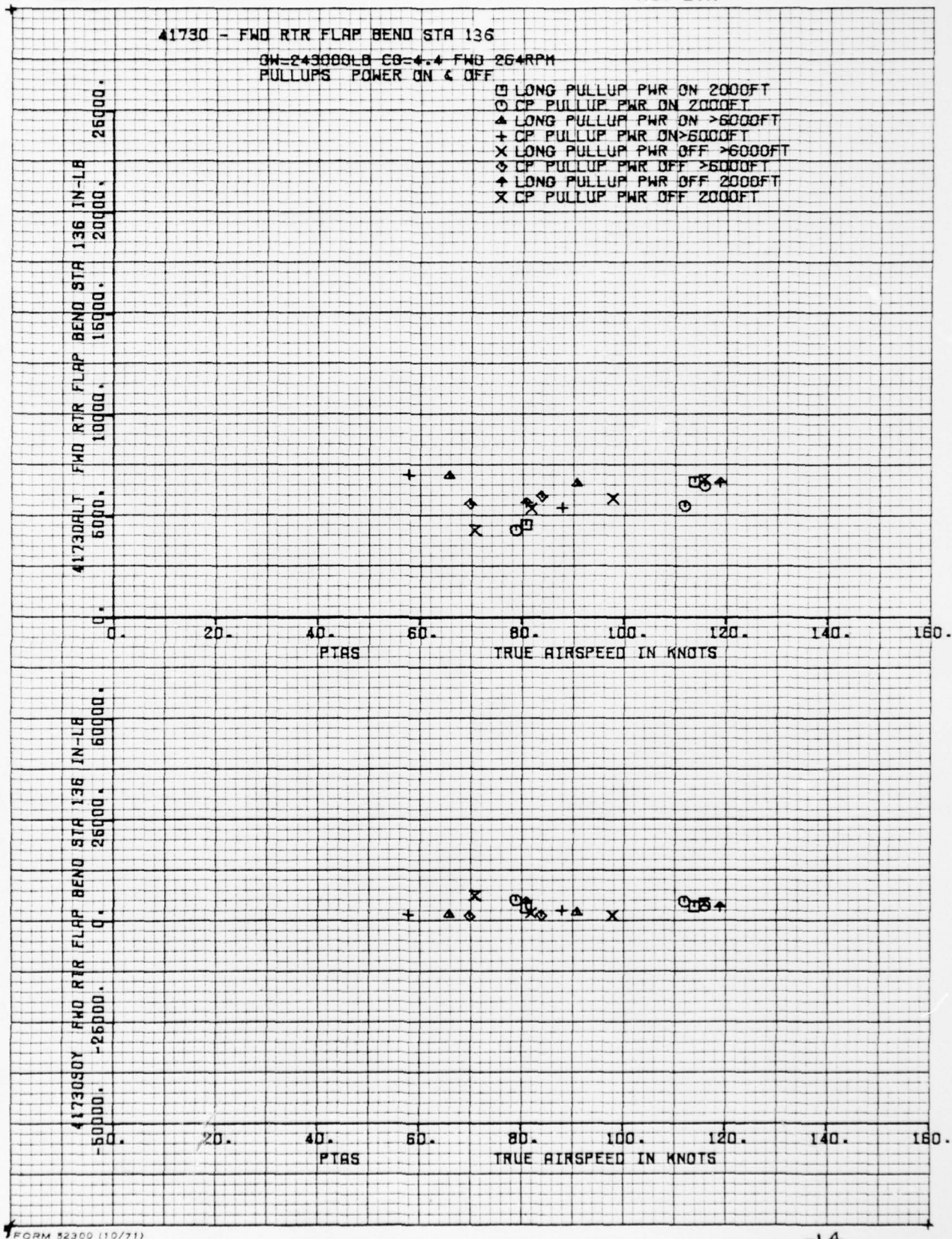
THE **BOEING** COMPANY

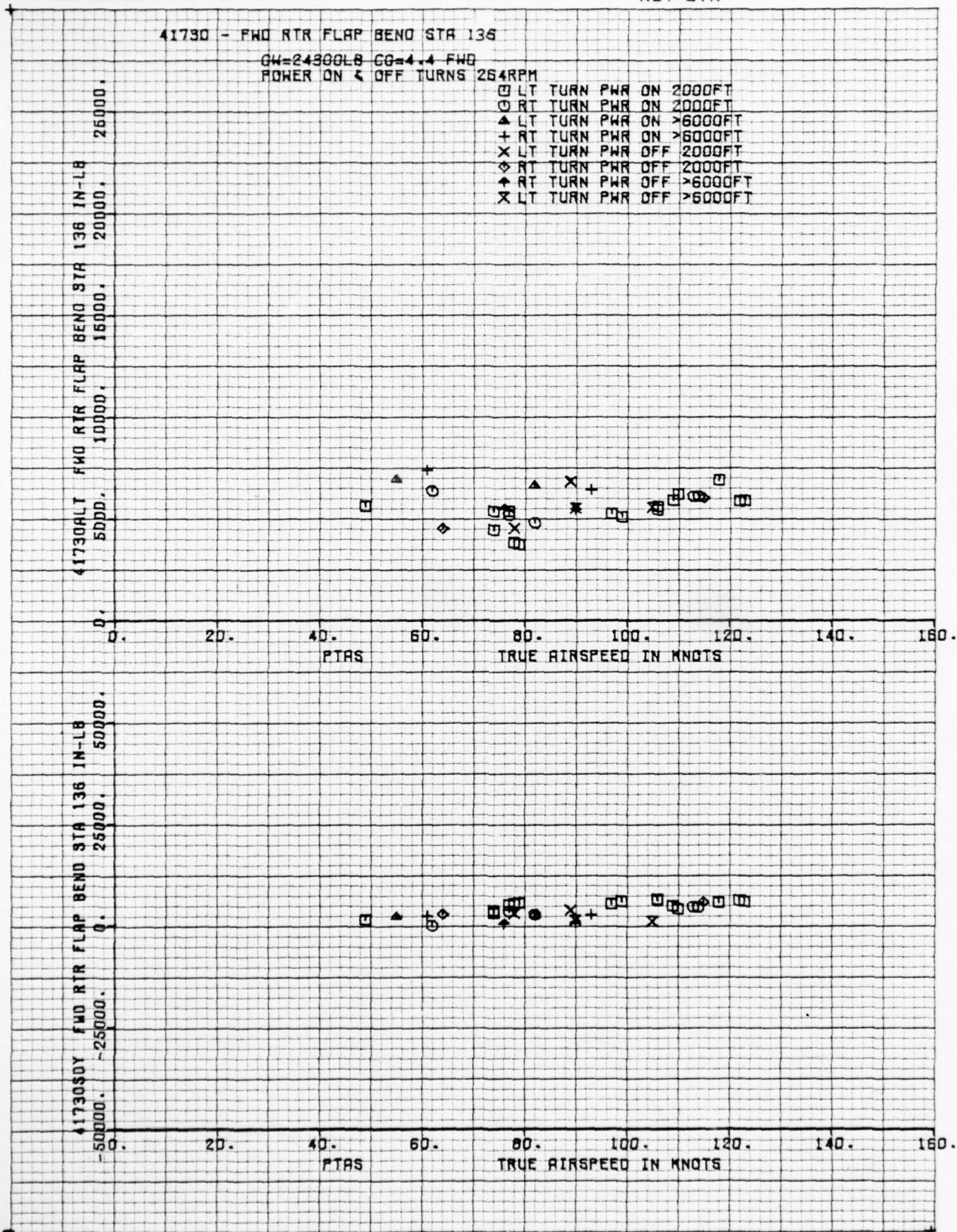
41730 - FWD RTR FLAP BEND STA 136

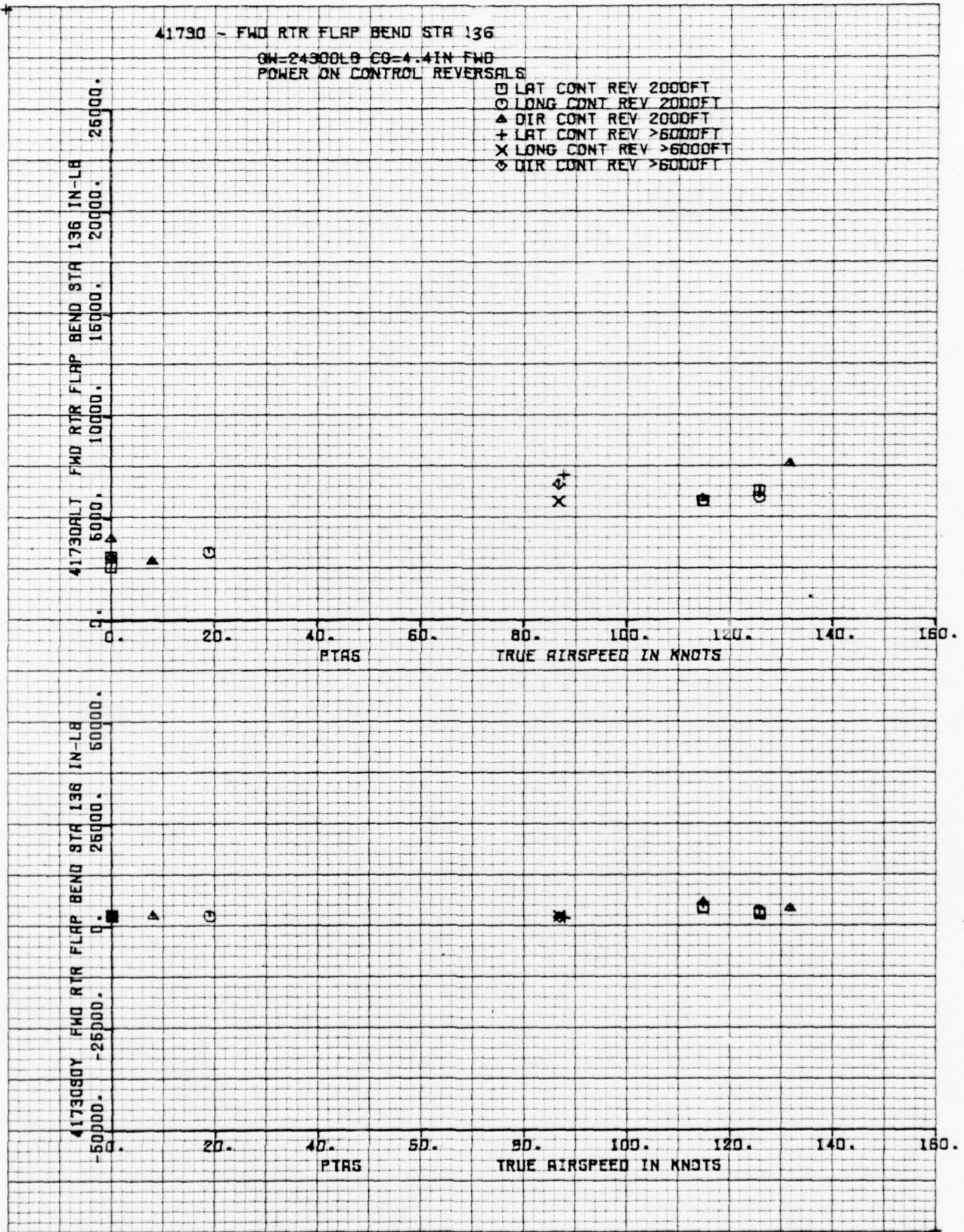
GW=24300LB CG=4.4IN FWD
HD=>6000FT 264RPM

□ FLT 141 LEVEL FLT

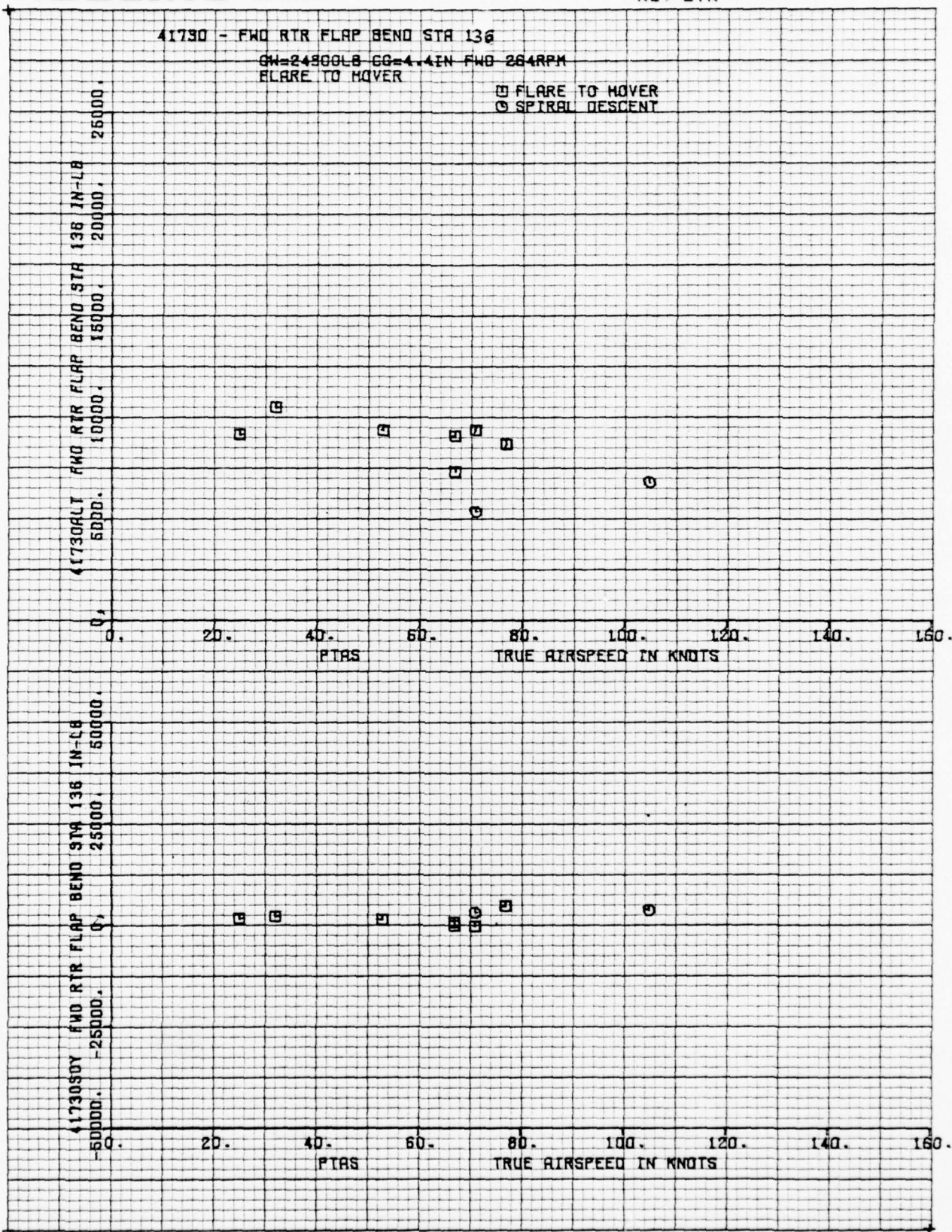
41730ALT FWD RTR FLAP BEND STA 136 IN-LB
25000.
20000.
15000.
10000.
5000.
0.41730SDY FWD RTR FLAP BEND STA 136 IN-LB
50000.
25000.
0.
-25000.
-50000.0. 20. 40. 60. 80. 100. 120. 140. 160.
PTAS TRUE AIRSPEED IN KNOTS0. 20. 40. 60. 80. 100. 120. 140. 160.
PTAS TRUE AIRSPEED IN KNOTS





THE **BOEING** COMPANY

FORM 52300 (10/71)



THE **BOEING** COMPANY

41730 - FWD RTR FLAP BEND STA 136

GW 24300LB CG=4.4IN FWD 264RPM

PPD & R/R

□ PPD 500 FPM

○ R/R STEADY

41730ALT FWD RTR FLAP BEND STA 136 IN-LB
25000.
20000.
15000.
10000.
5000.
0.41730SDY FWD RTR FLAP BEND STA 136 IN-LB
50000.
25000.
0.
-25000.
-50000.

0.

20.

40.

60.

80.

100.

120.

140.

160.

PTAS

TRUE AIRSPEED IN KNOTS

0.

20.

40.

60.

80.

100.

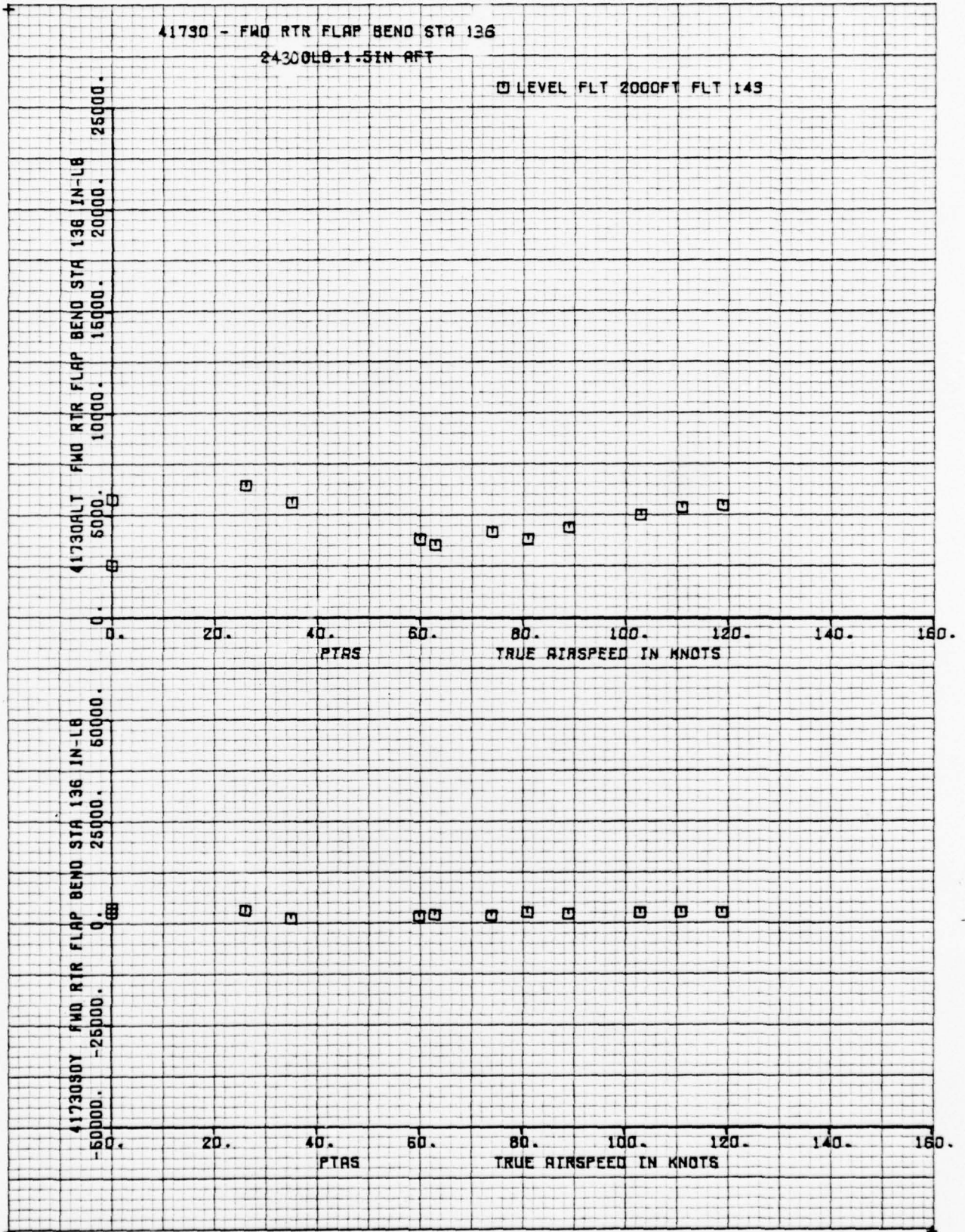
120.

140.

160.

PTAS

TRUE AIRSPEED IN KNOTS

THE **BOEING** COMPANY

FORM 52300 (10/71)

THE **BOEING** COMPANY

PREPARED BY: J. Bendo

CHECKED BY:

DATE: 8/28/78

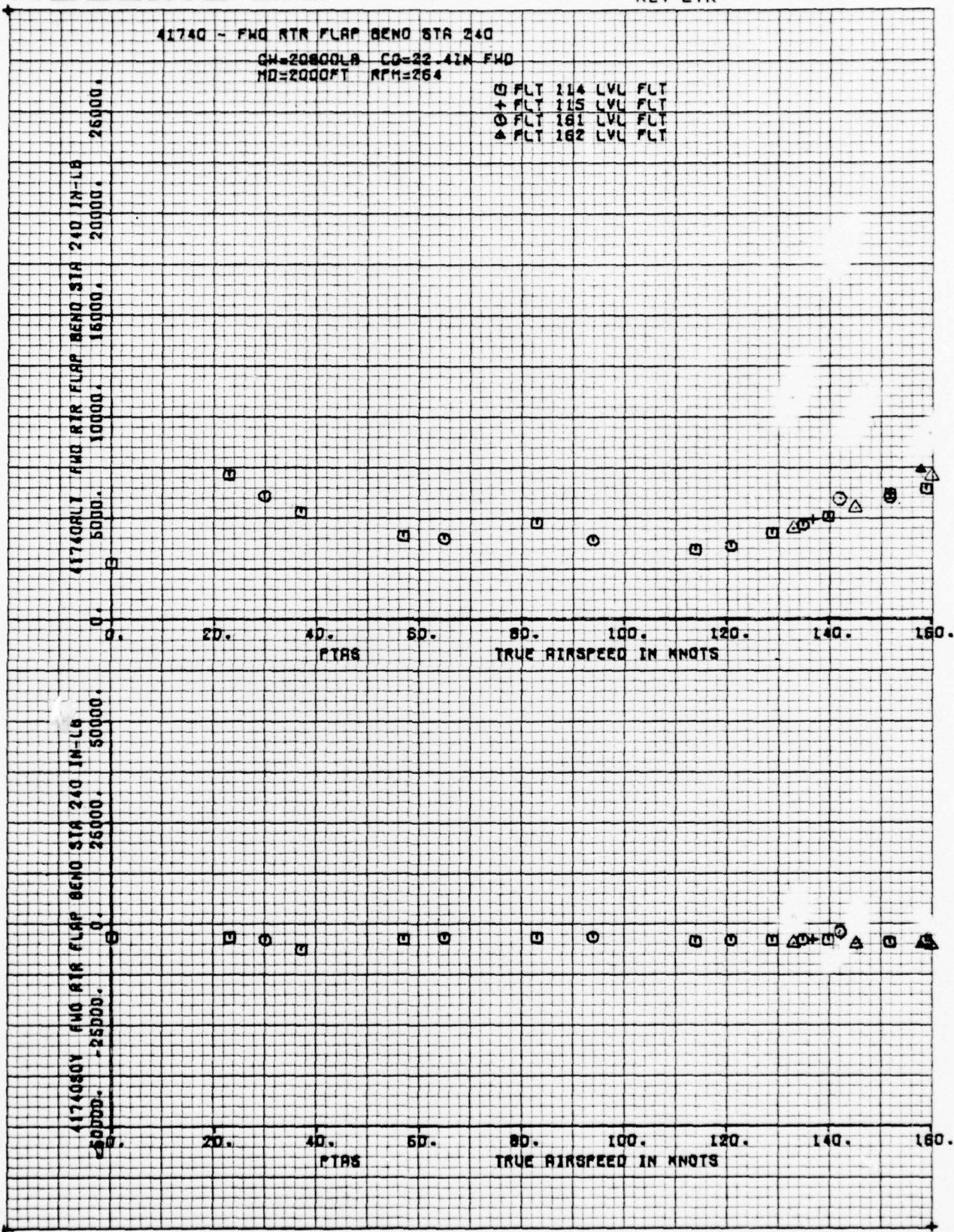
NUMBER D210-11168-3

REV LTR Volume 2

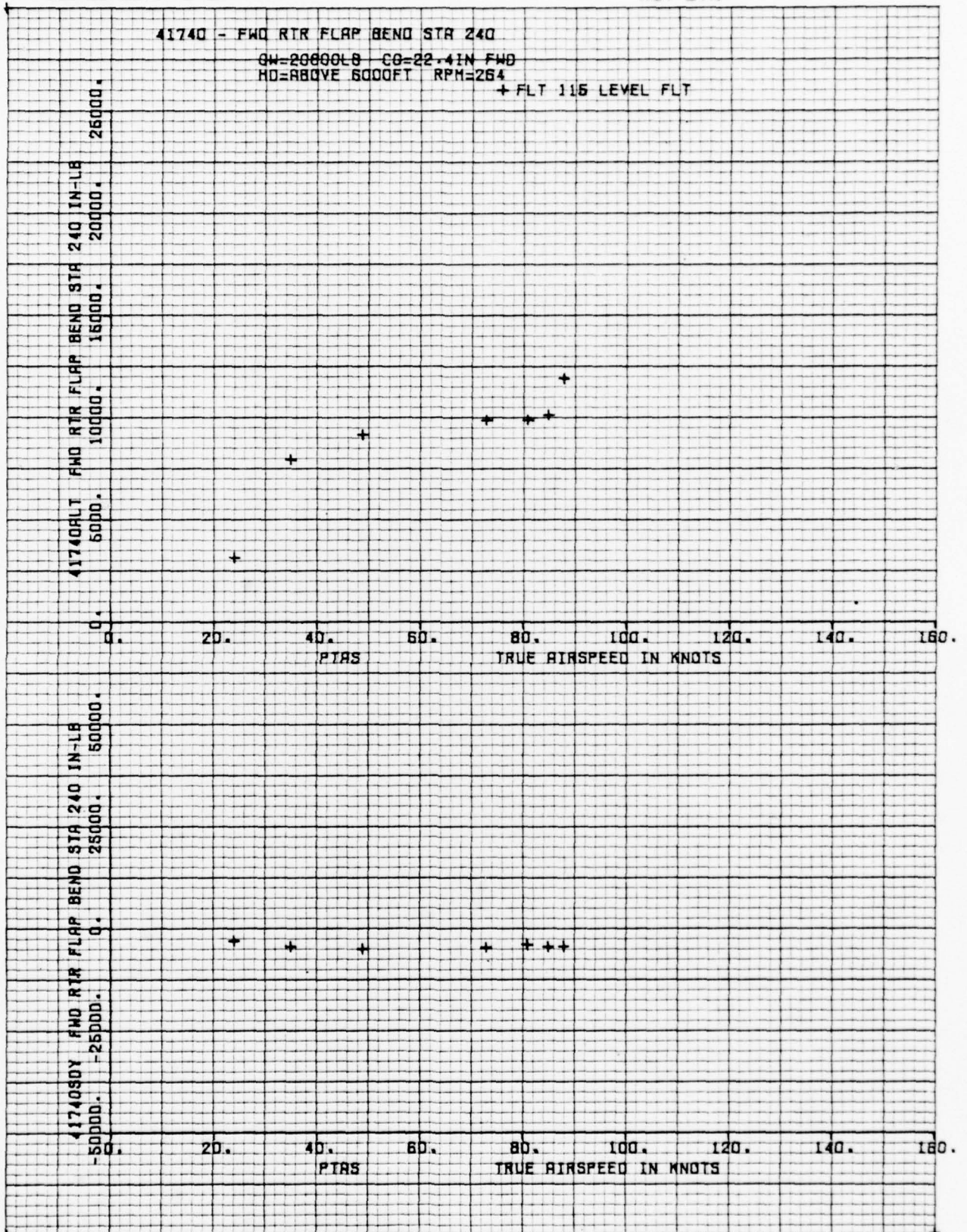
MODEL NO.

4.8 Forward Blade Flap Bending Station 240.

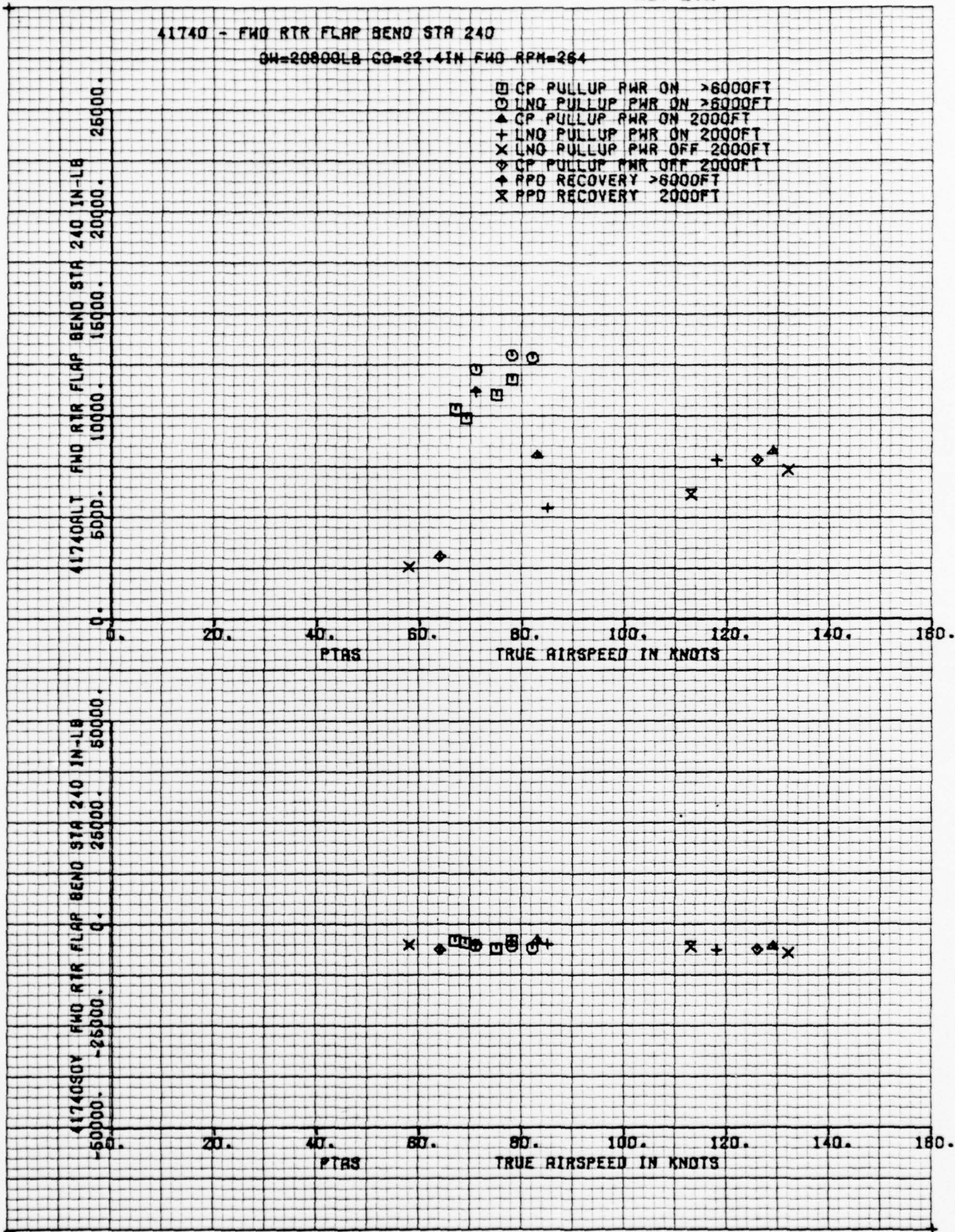
THE **BOEING** COMPANY

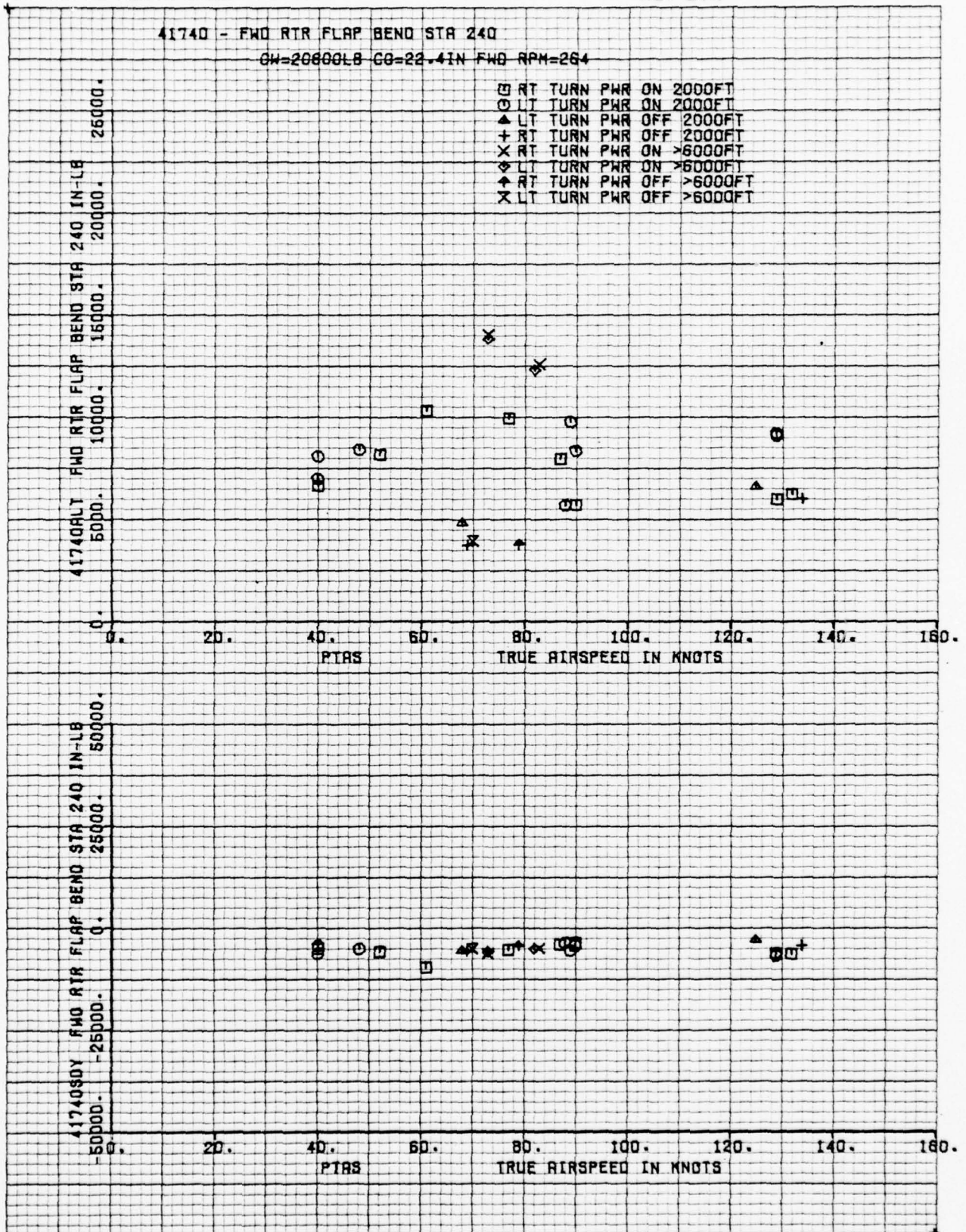


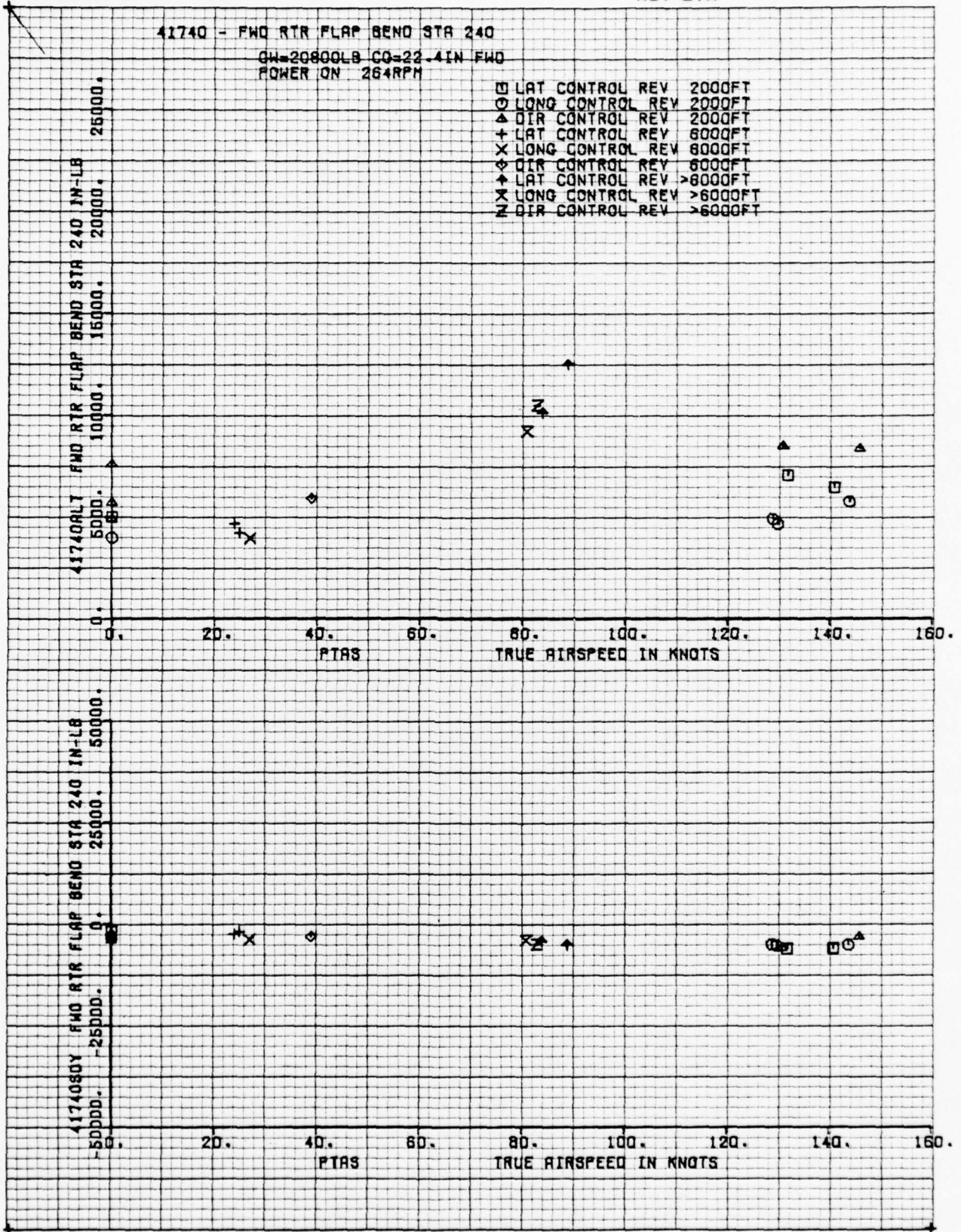
FORM 52300 (10/71)



FORM 52300 (10/71)



THE **BOEING** COMPANY

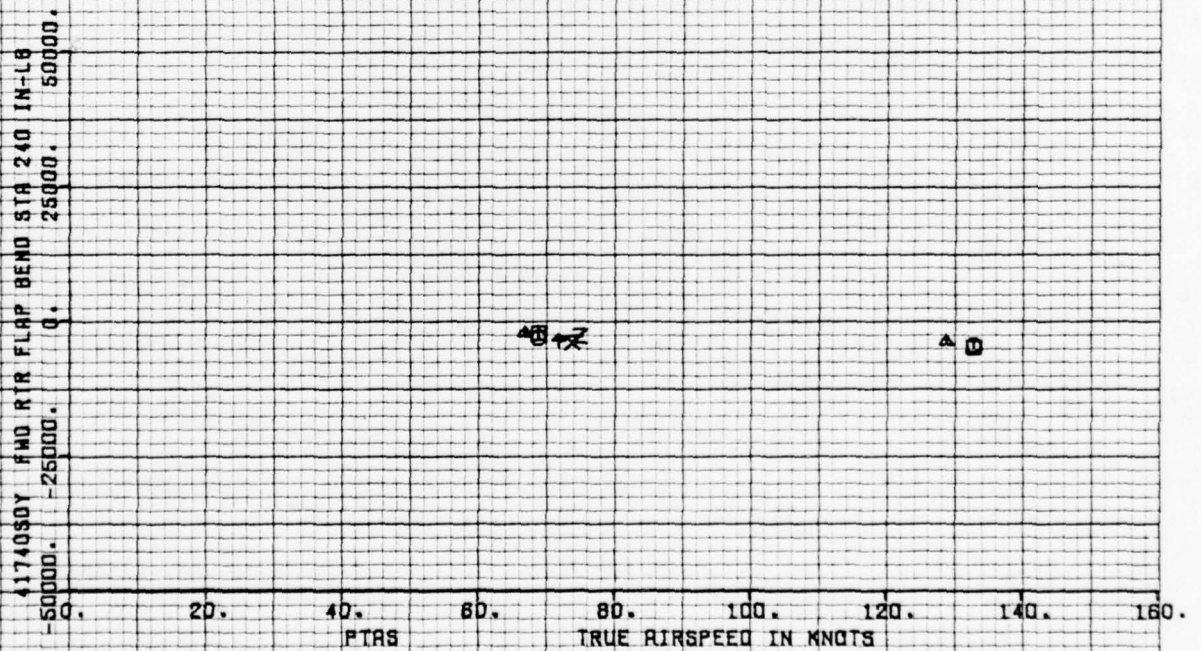
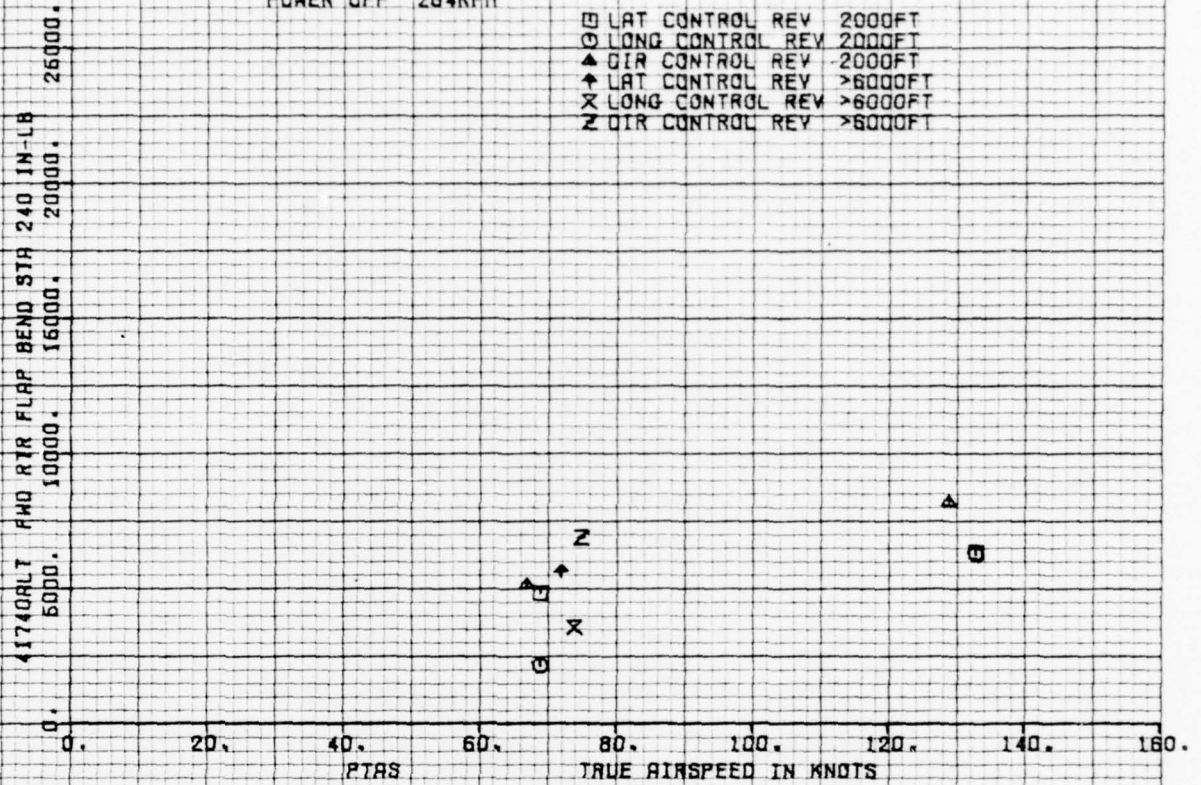


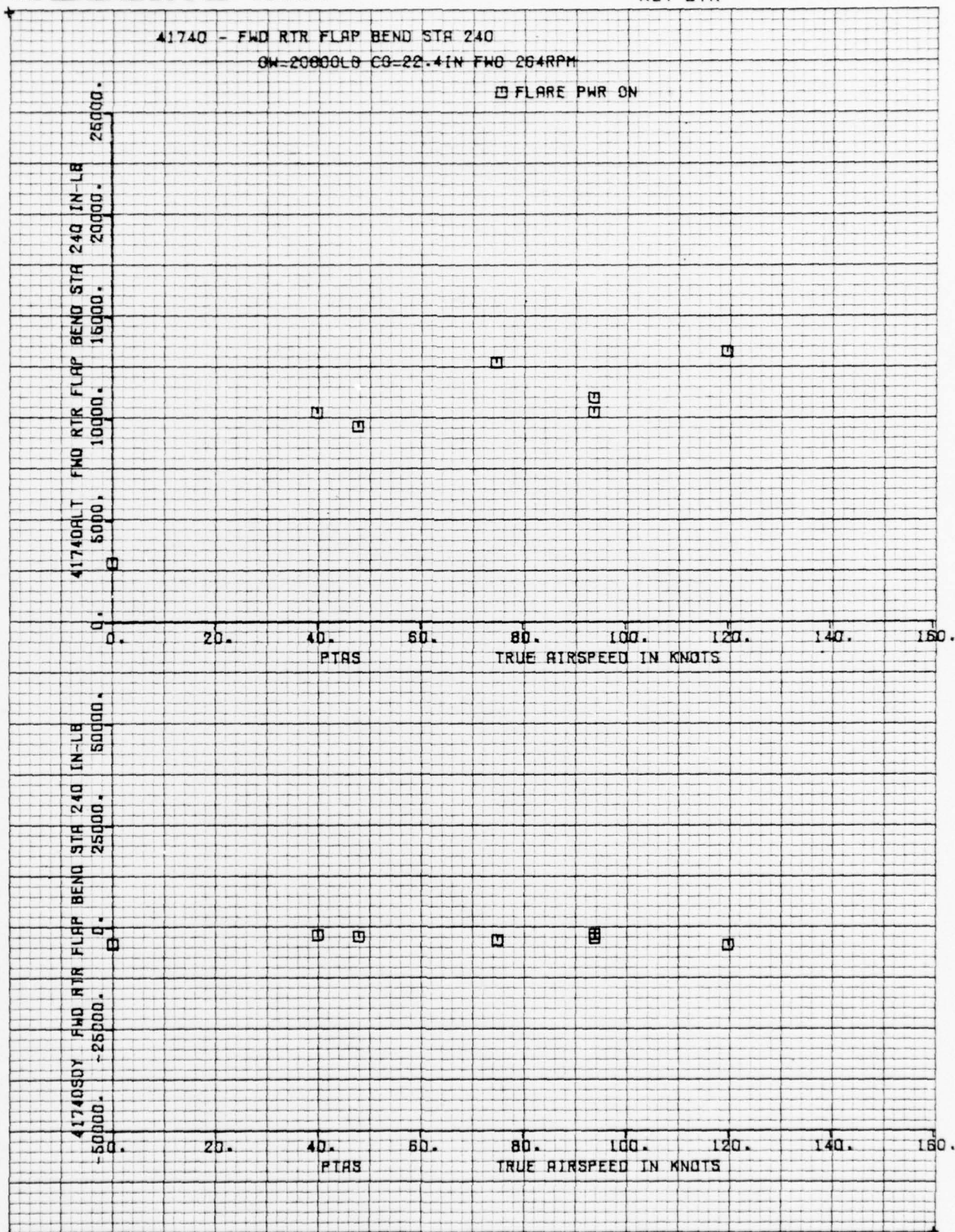
THE **BOEING** COMPANY

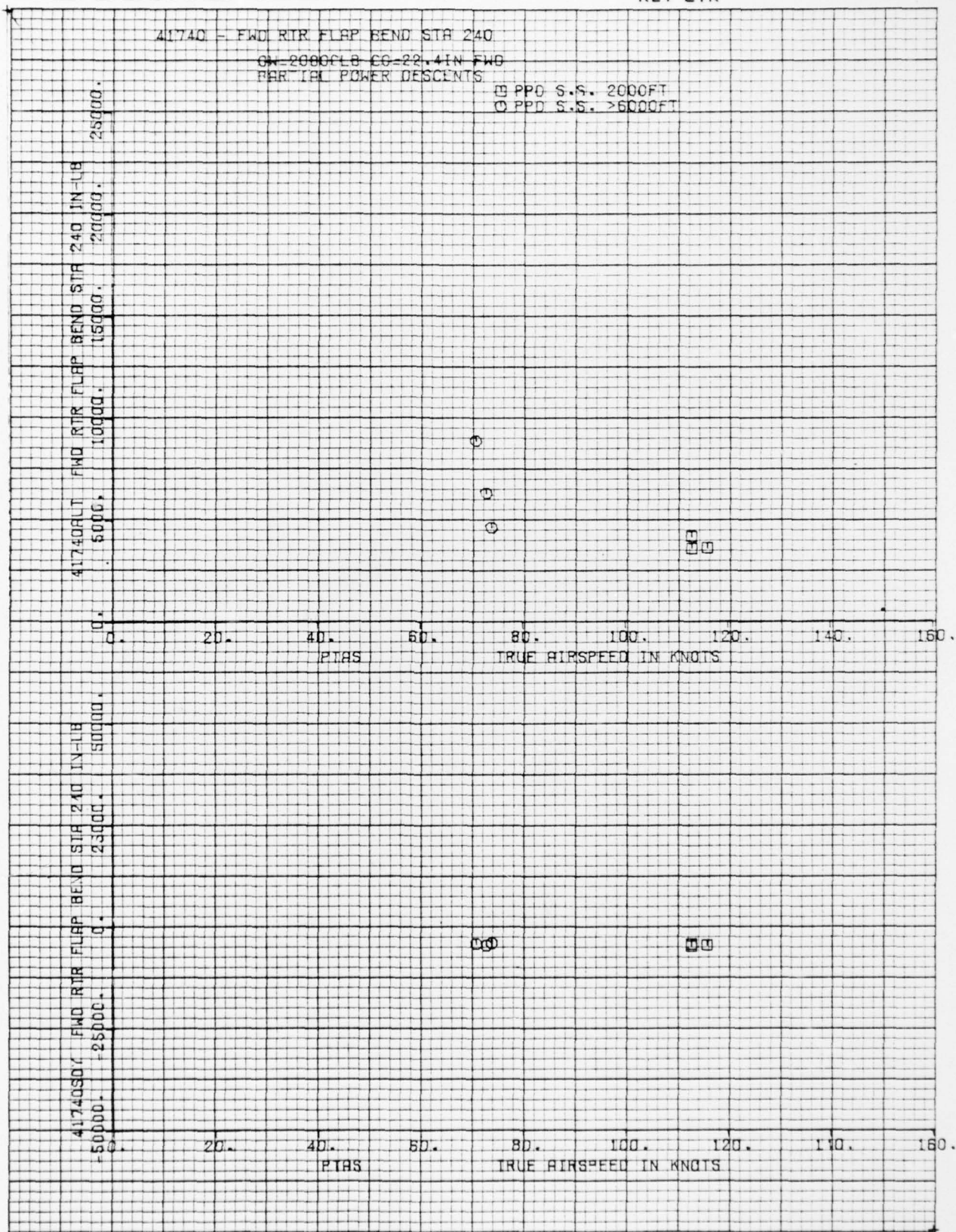
41740 - FWD RTR FLAP BEND STA 240

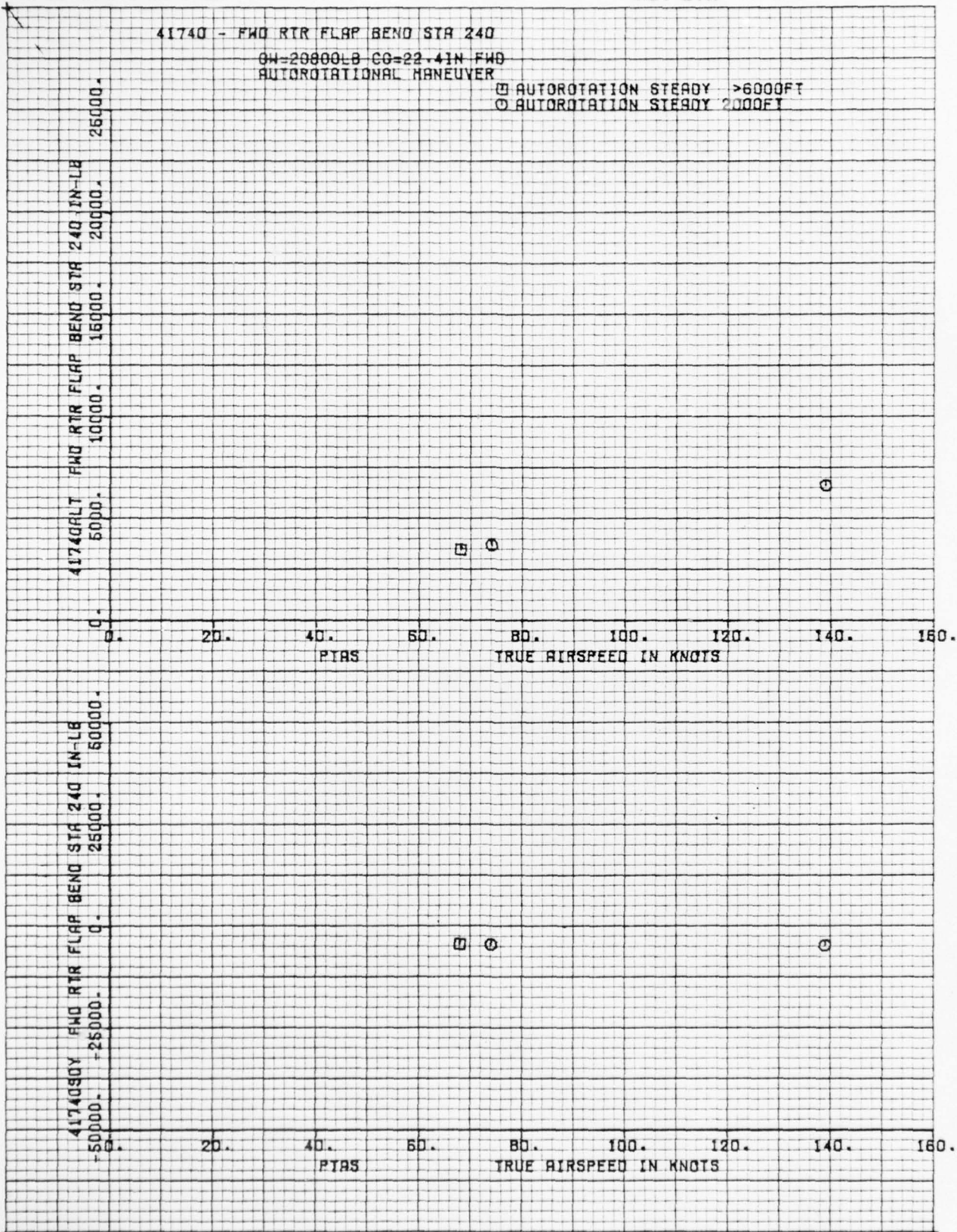
GW=20800LB CG=22.4IN FWD
POWER OFF 264RPM

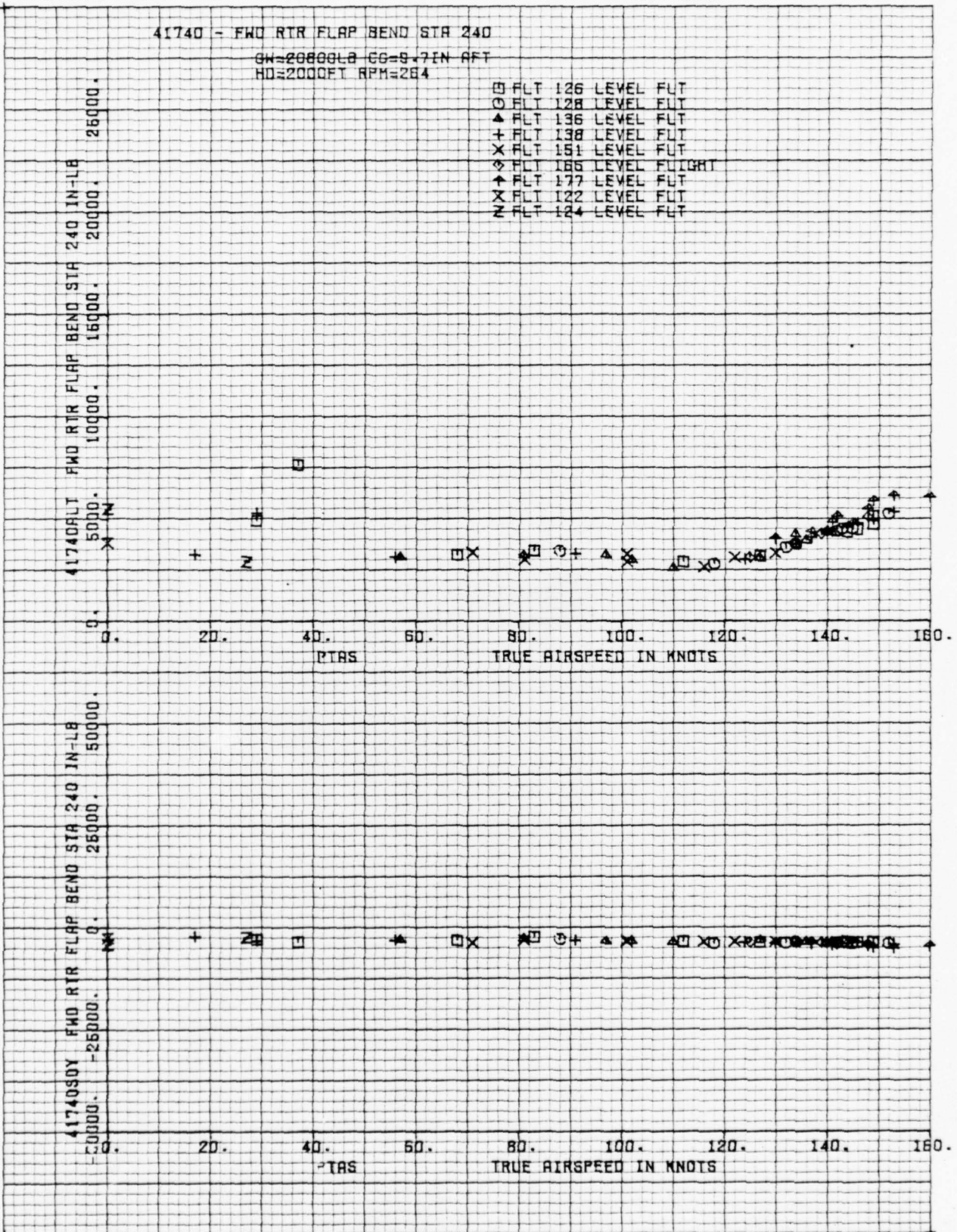
□ LAT CONTROL REV 2000FT
 ○ LONG CONTROL REV 2000FT
 ▲ DIR CONTROL REV 2000FT
 ◆ LAT CONTROL REV >6000FT
 X LONG CONTROL REV >6000FT
 Z DIR CONTROL REV >6000FT

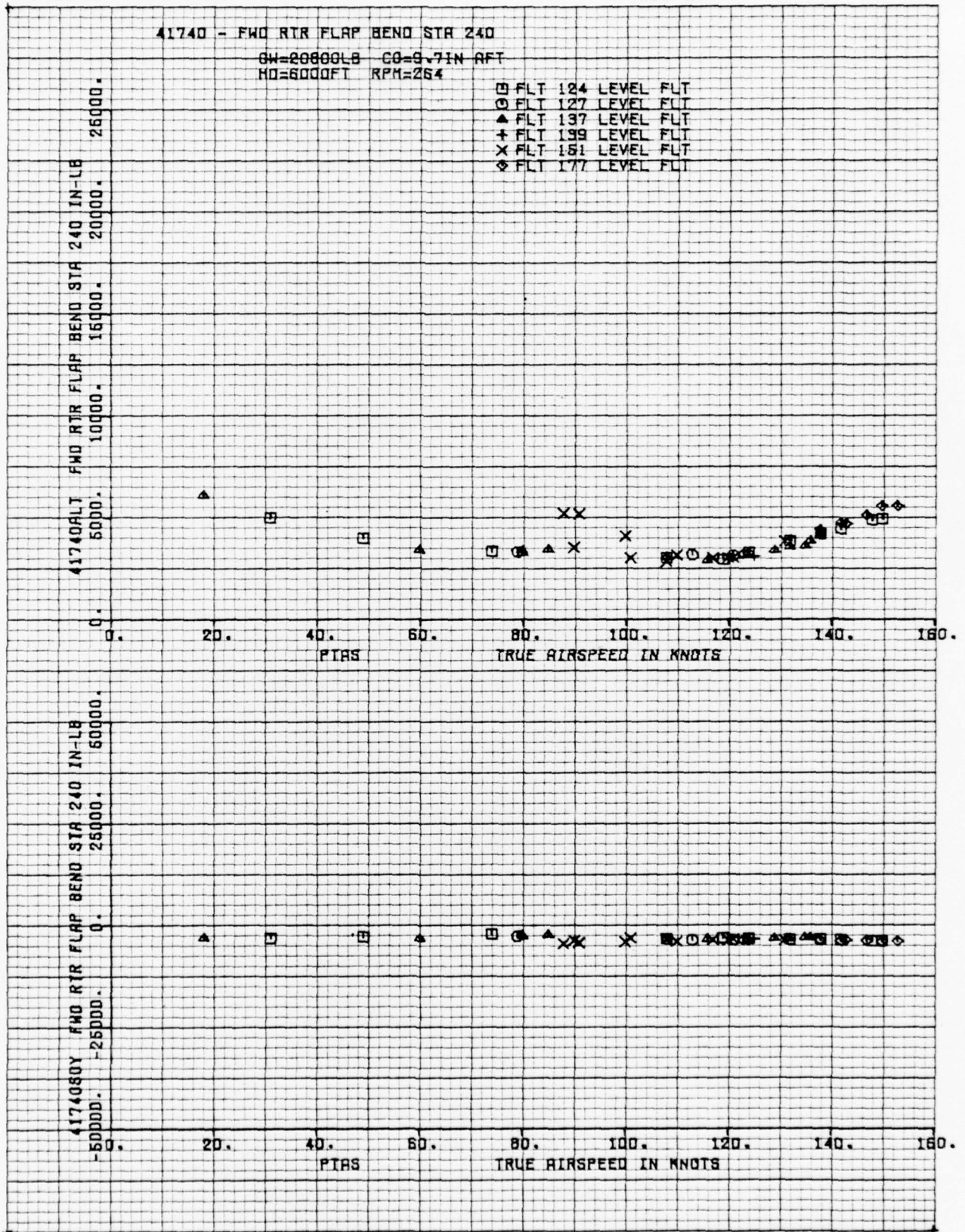




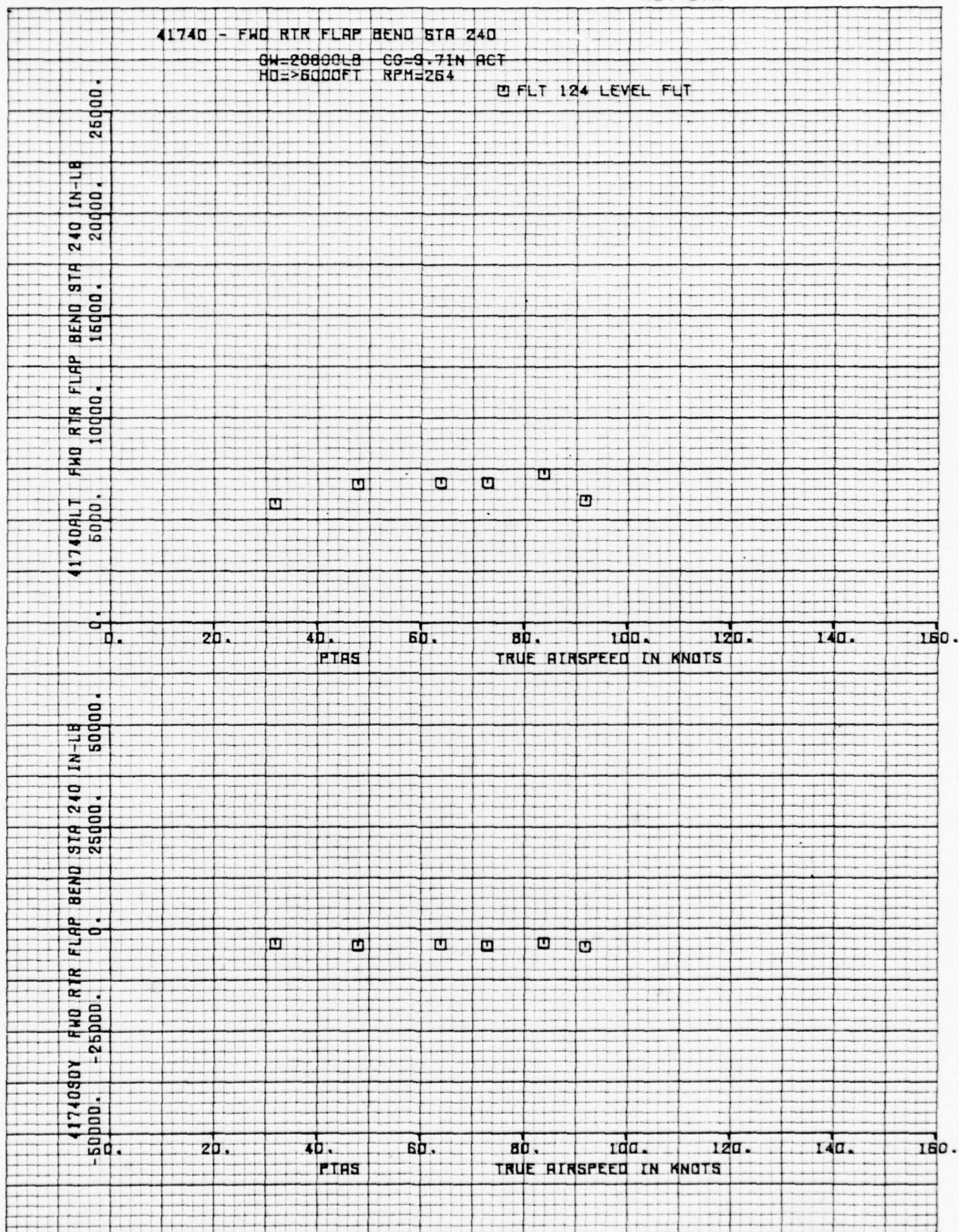




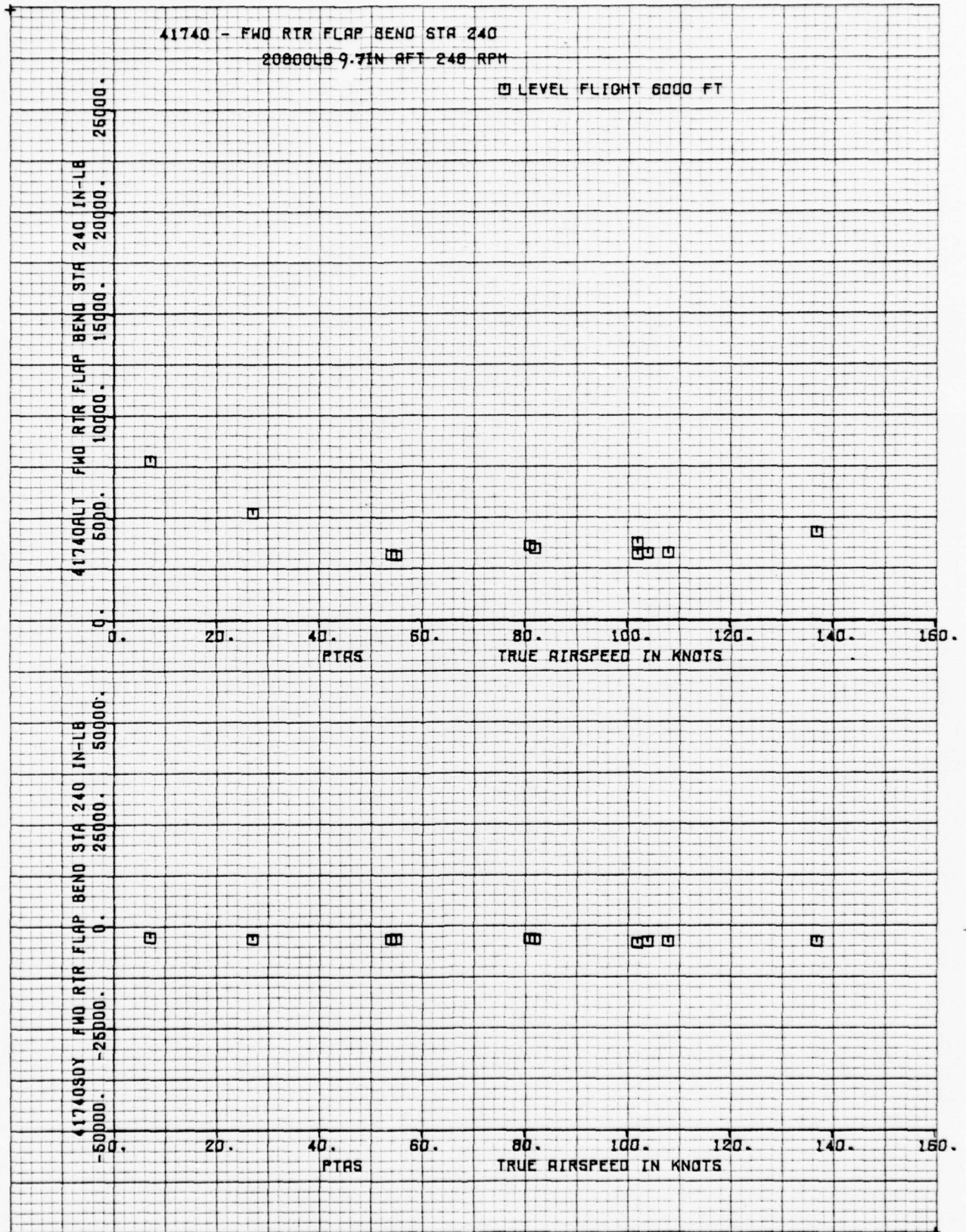
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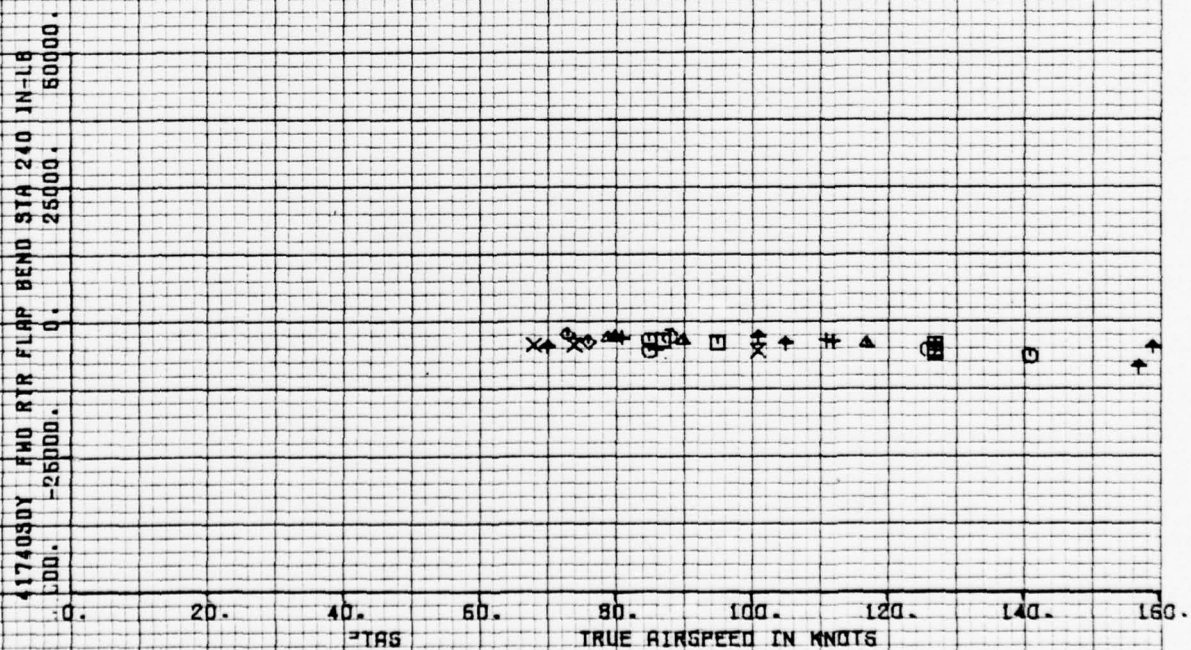
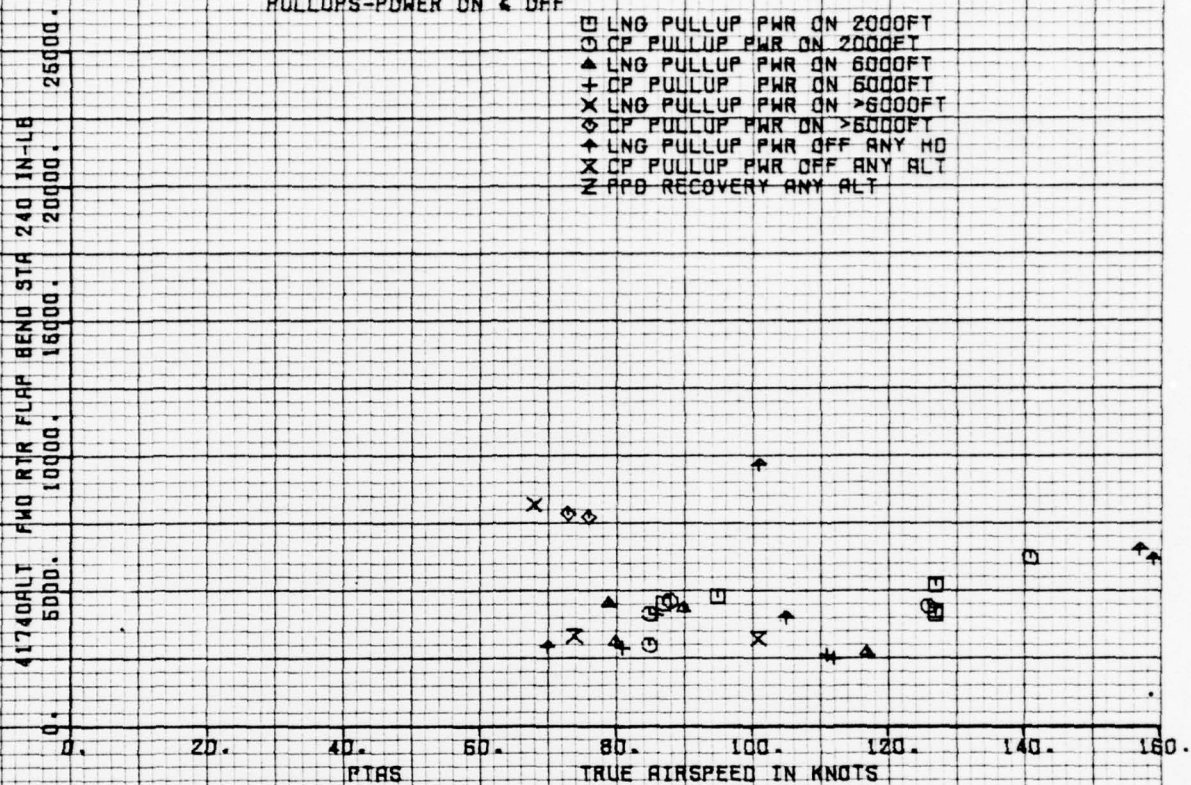
FORM 52300 (10/71)

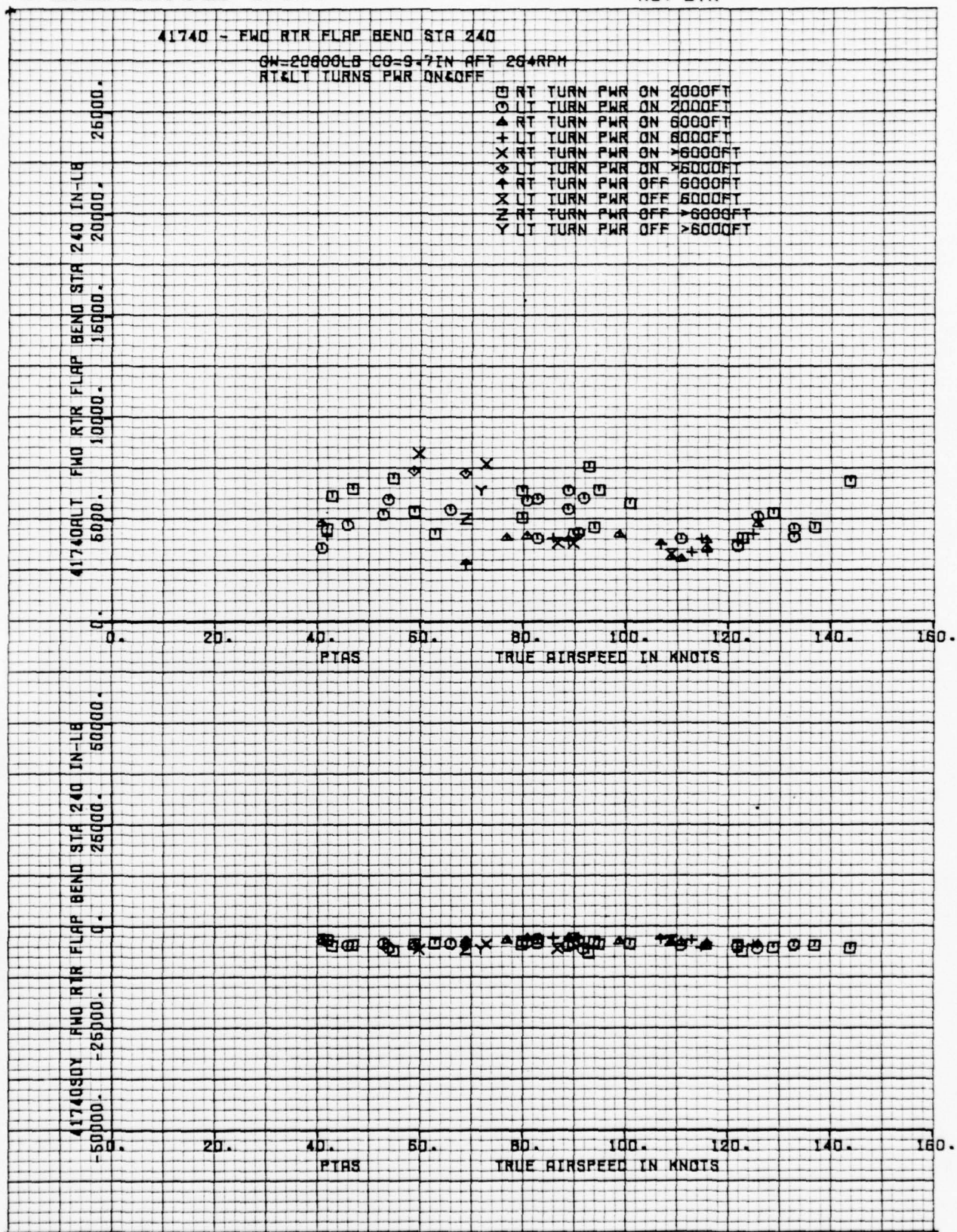
THE **BOEING** COMPANY

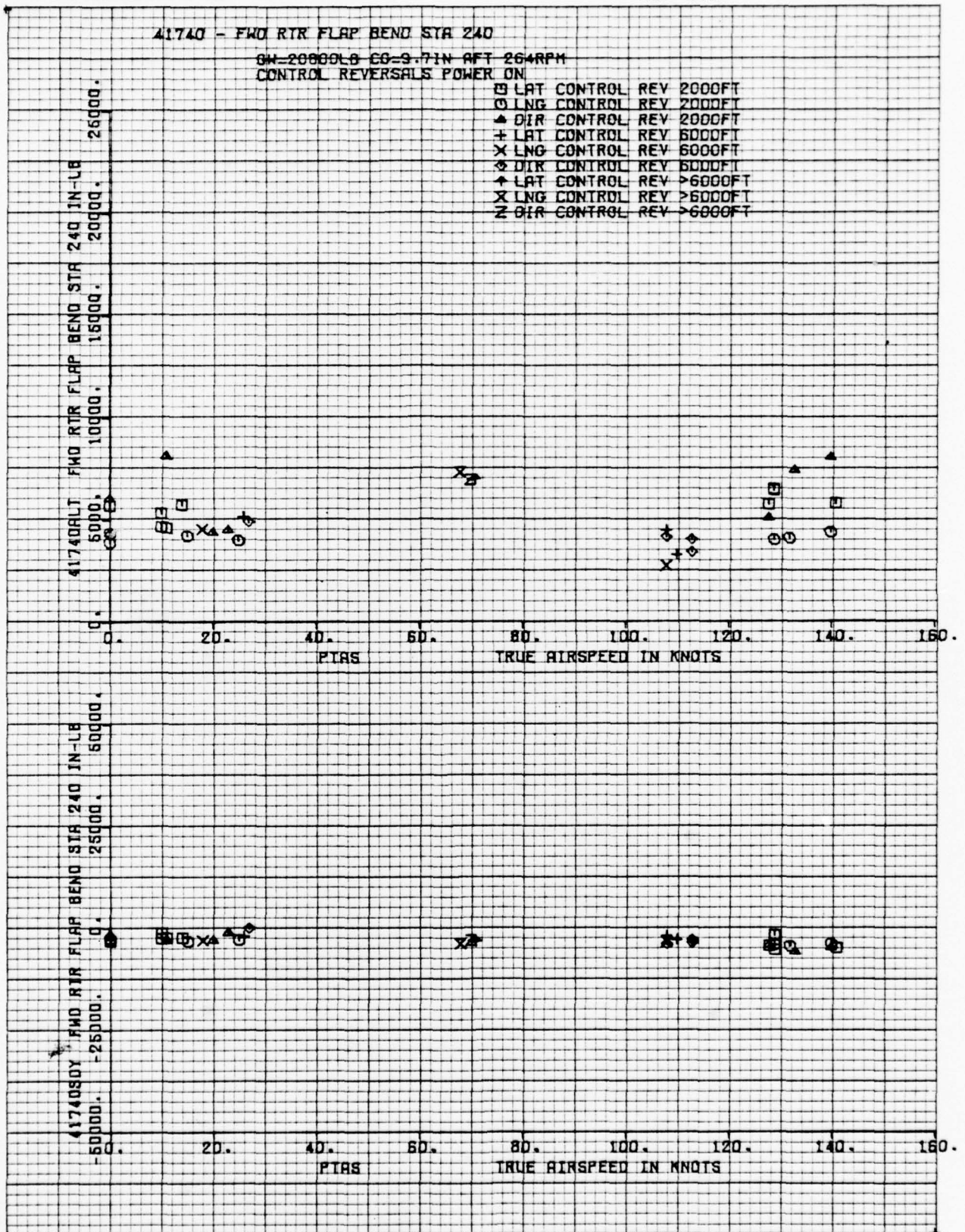
41740 - FWD RTR FLAP BEND STA 240

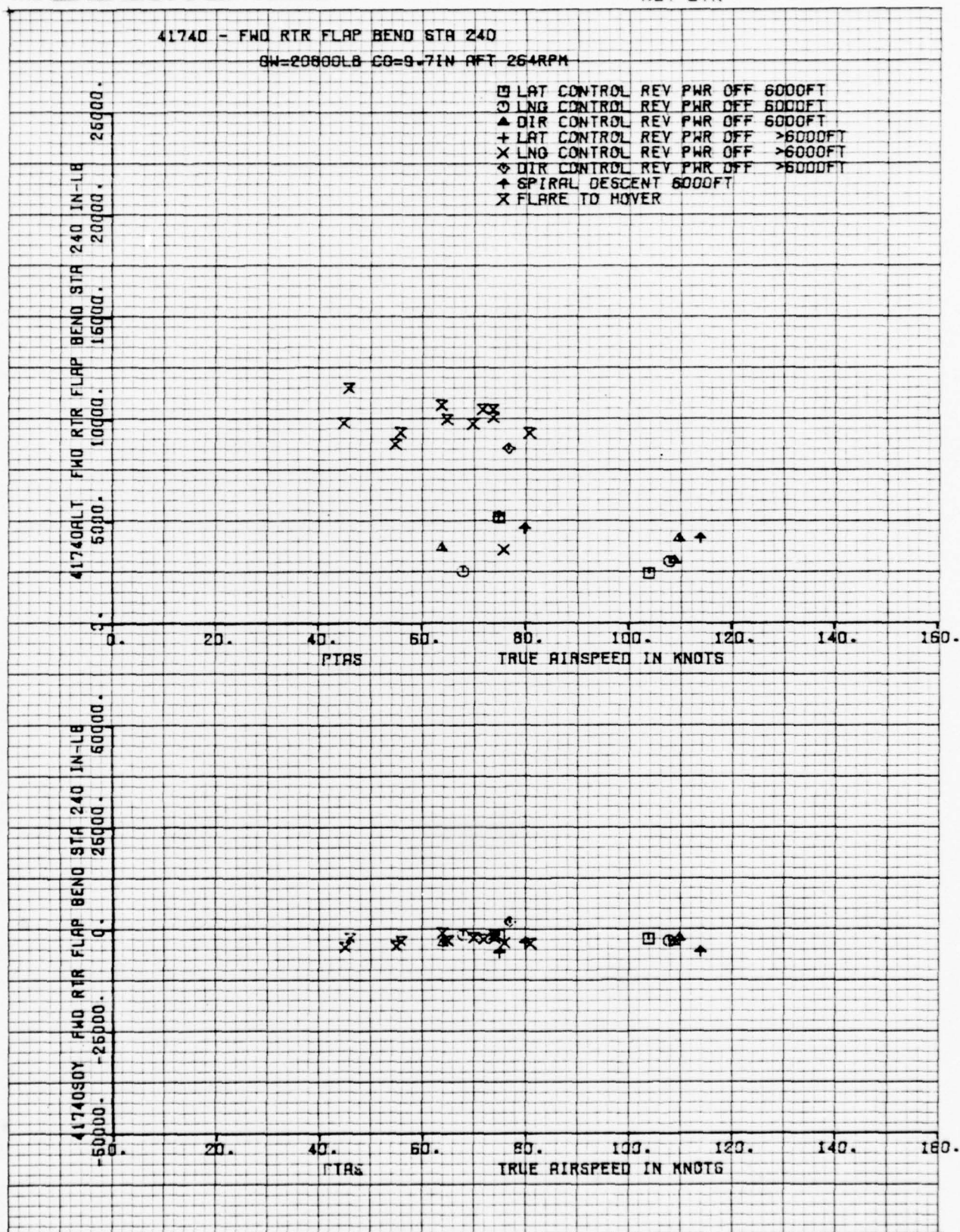
GW=20800LB CG=9.7IN AFT 264ROM
PULLUPS-POWER ON & OFF

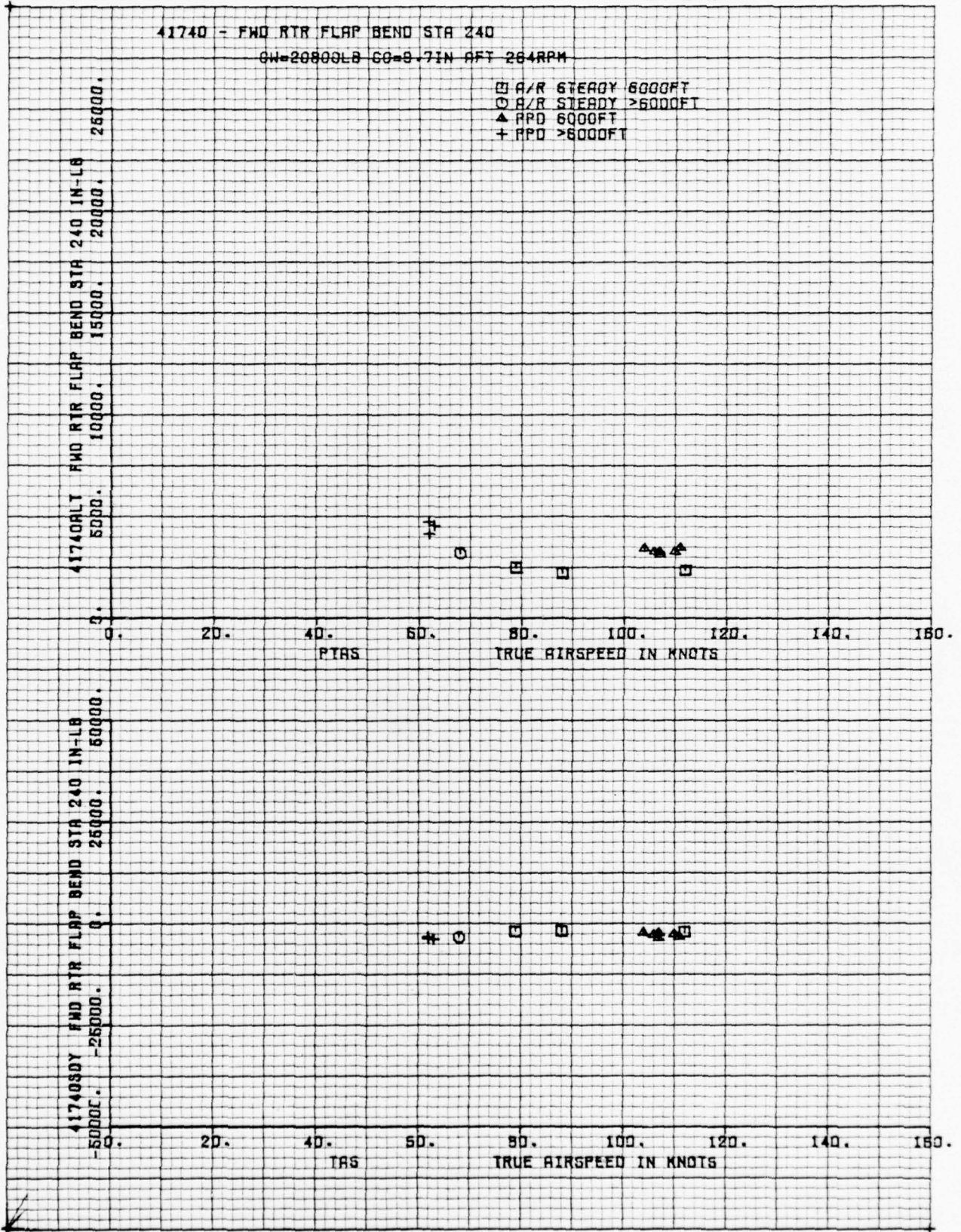
□ LNG PULLUP PWR ON 2000FT
 ○ CP PULLUP PWR ON 2000FT
 ▲ LNG PULLUP PWR ON 6000FT
 + CP PULLUP PWR ON 6000FT
 X LNG PULLUP PWR ON >6000FT
 ◇ CP PULLUP PWR ON >6000FT
 † LNG PULLUP PWR OFF ANY HD
 X CP PULLUP PWR OFF ANY ALT
 Z PPO RECOVERY ANY ALT

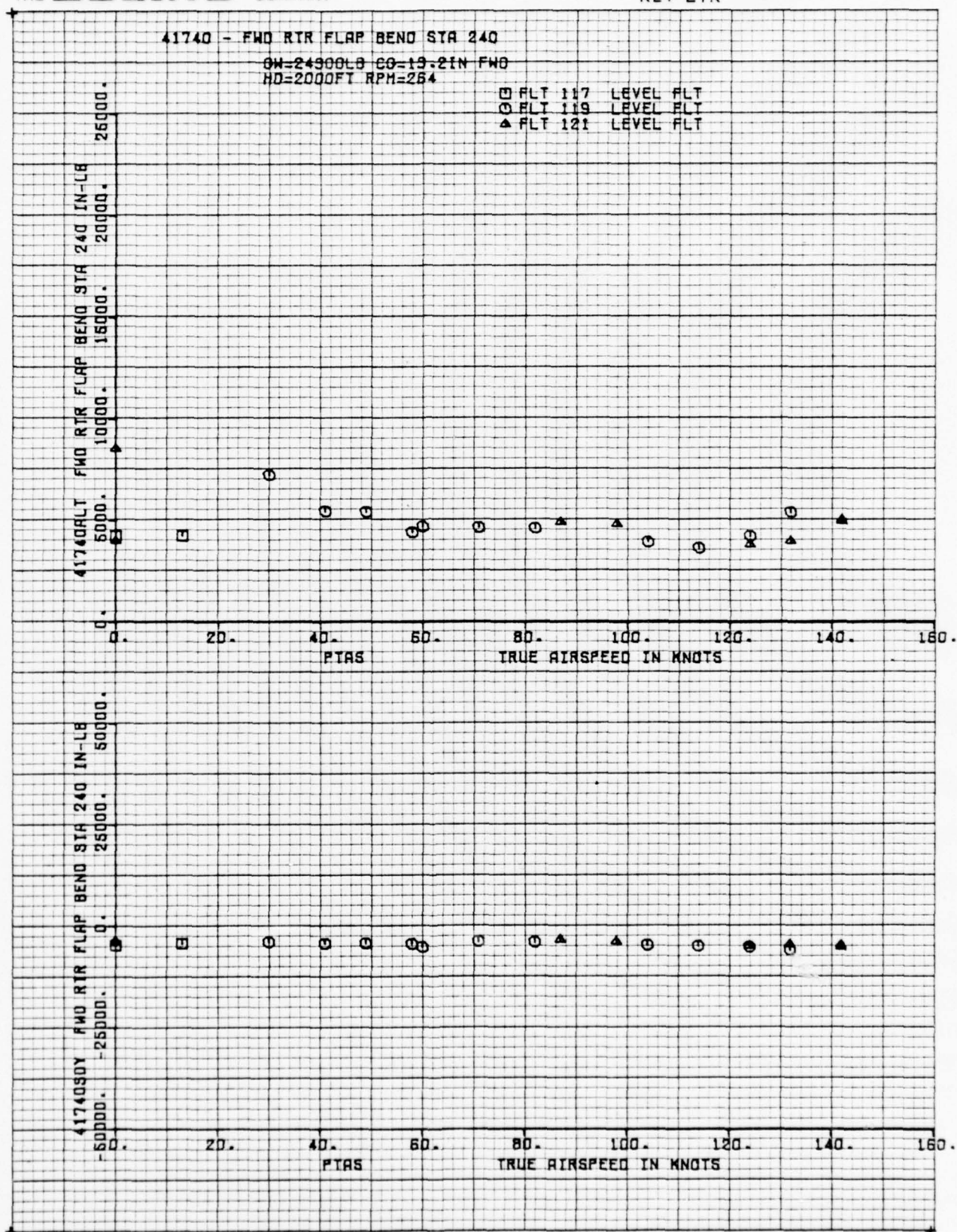


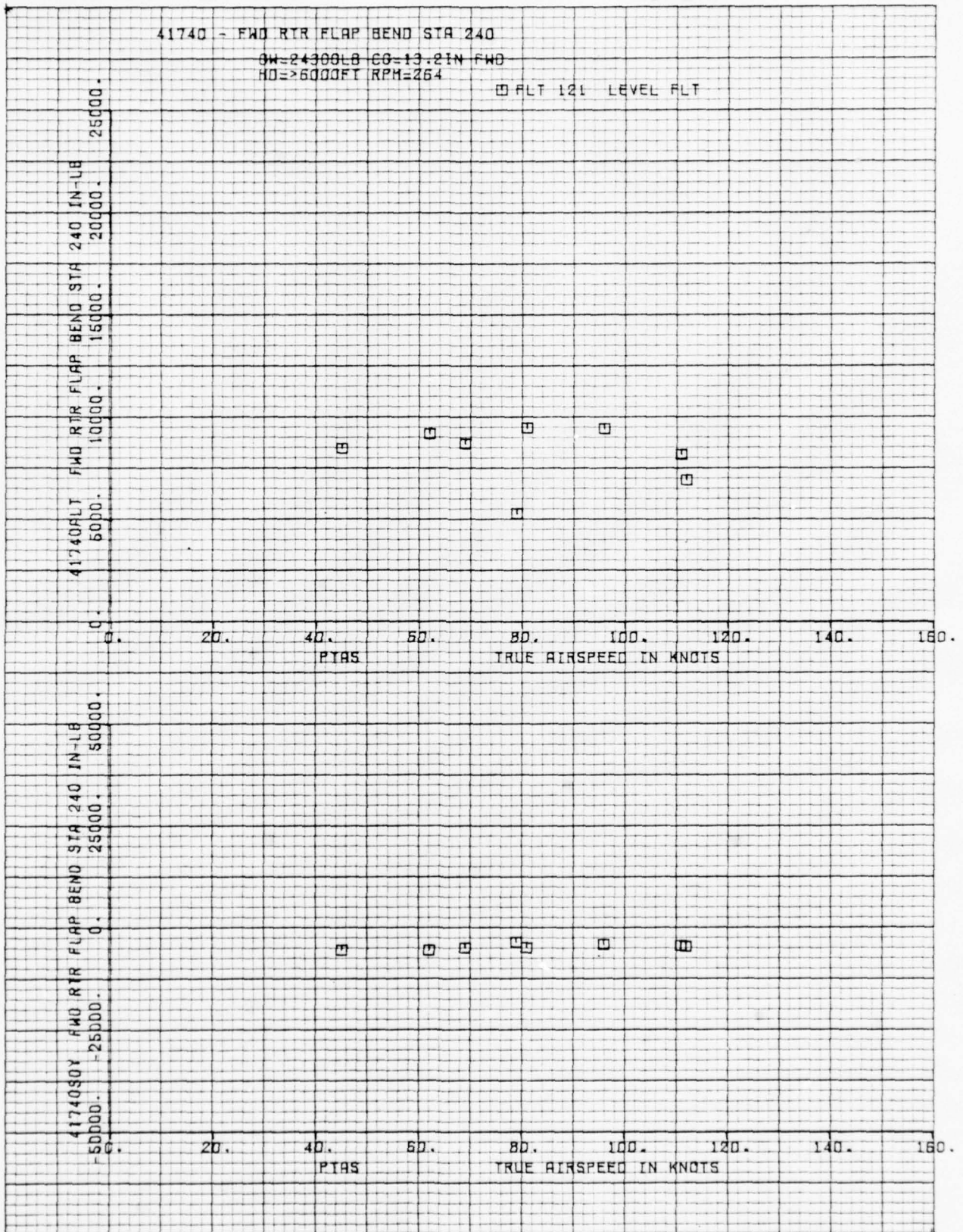
THE **BOEING** COMPANY









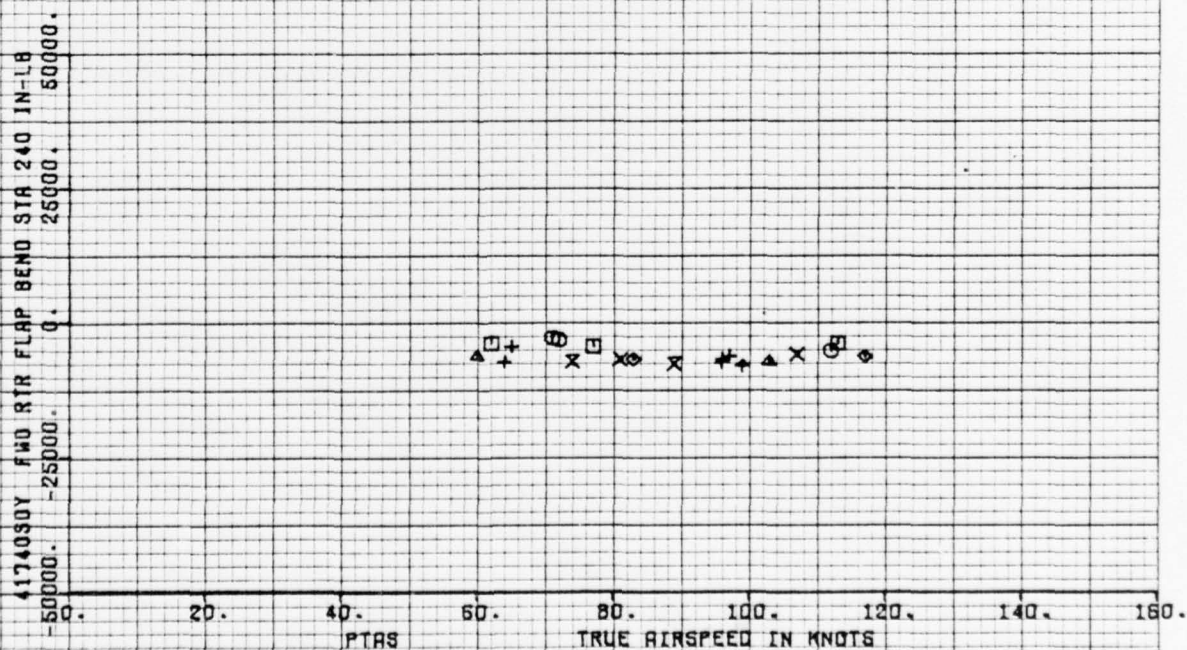
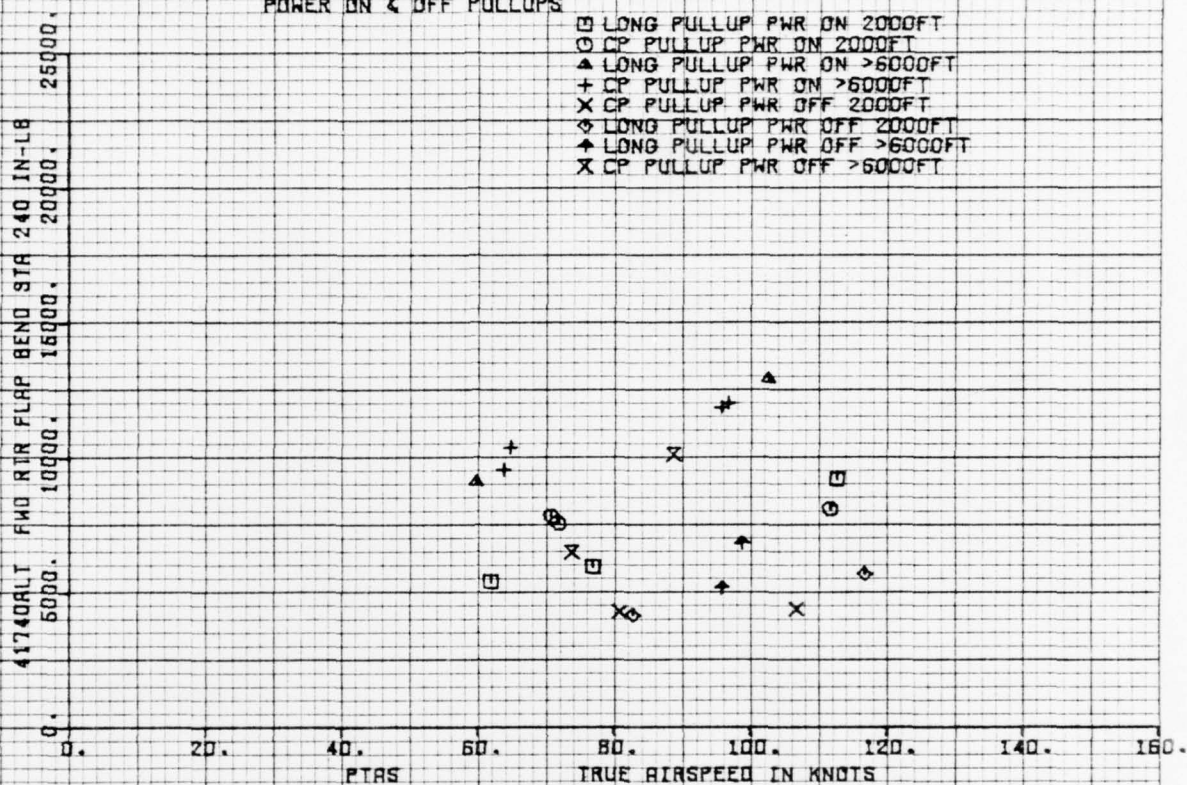


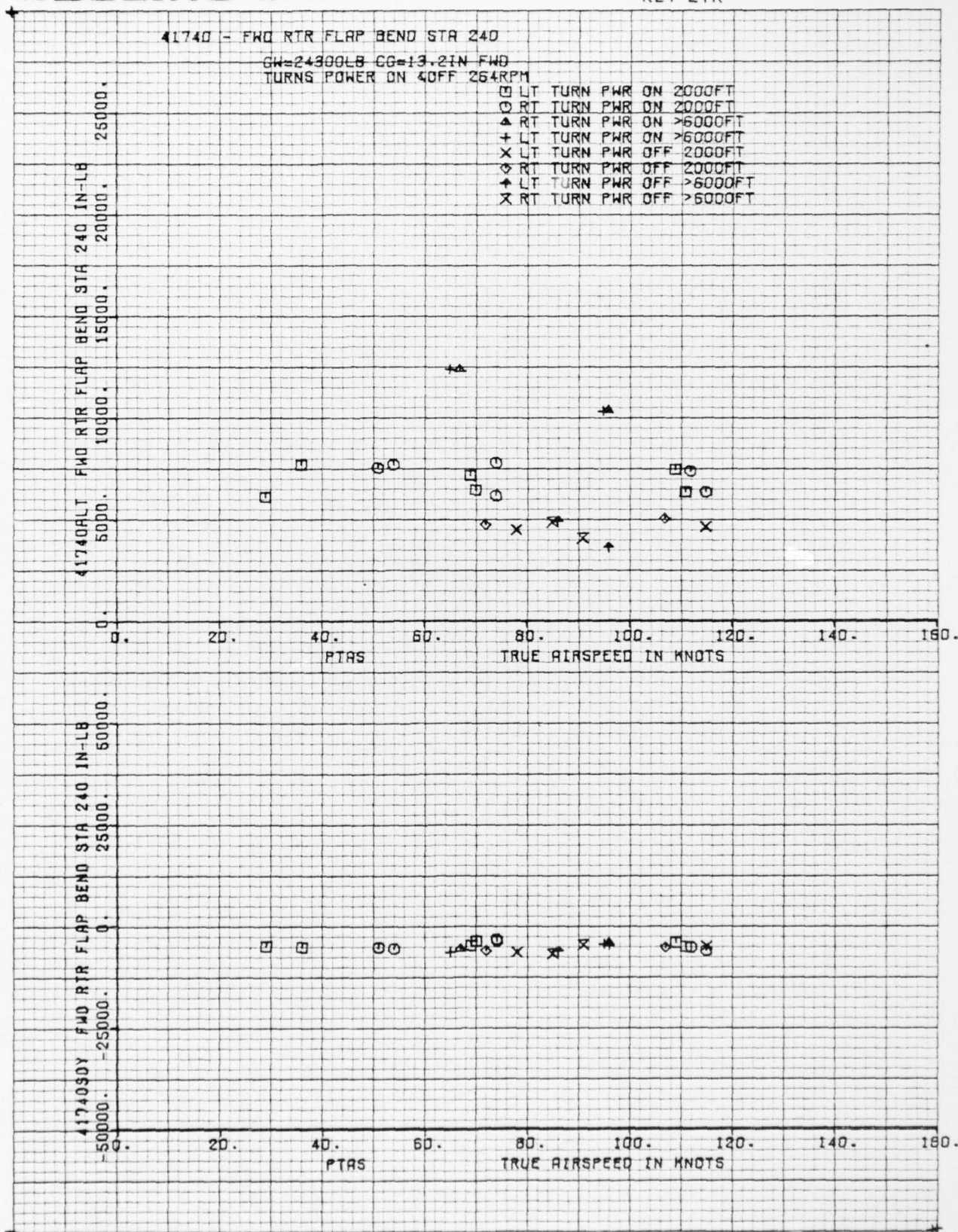
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41740 - FWD RTR FLAP BEND STA 240

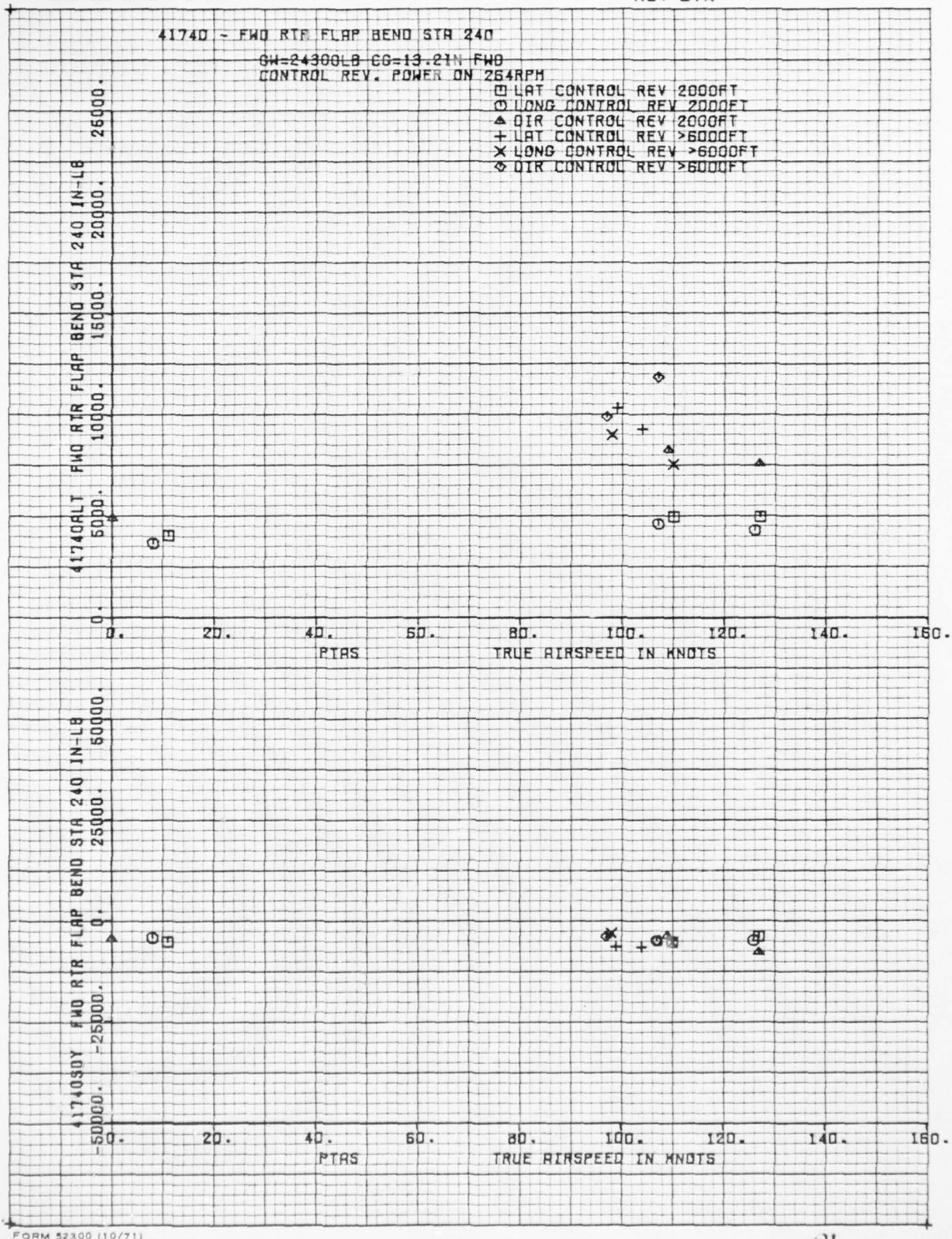
GW=24300LB CG=13.2IN FWD
POWER ON & OFF PULLUPS

- LONG PULLUP PWR ON 2000FT
- CP PULLUP PWR ON 2000FT
- ▲ LONG PULLUP PWR ON >6000FT
- + CP PULLUP PWR ON >6000FT
- × CP PULLUP PWR OFF 2000FT
- ◇ LONG PULLUP PWR OFF 2000FT
- ◆ LONG PULLUP PWR OFF >6000FT
- × CP PULLUP PWR OFF >6000FT

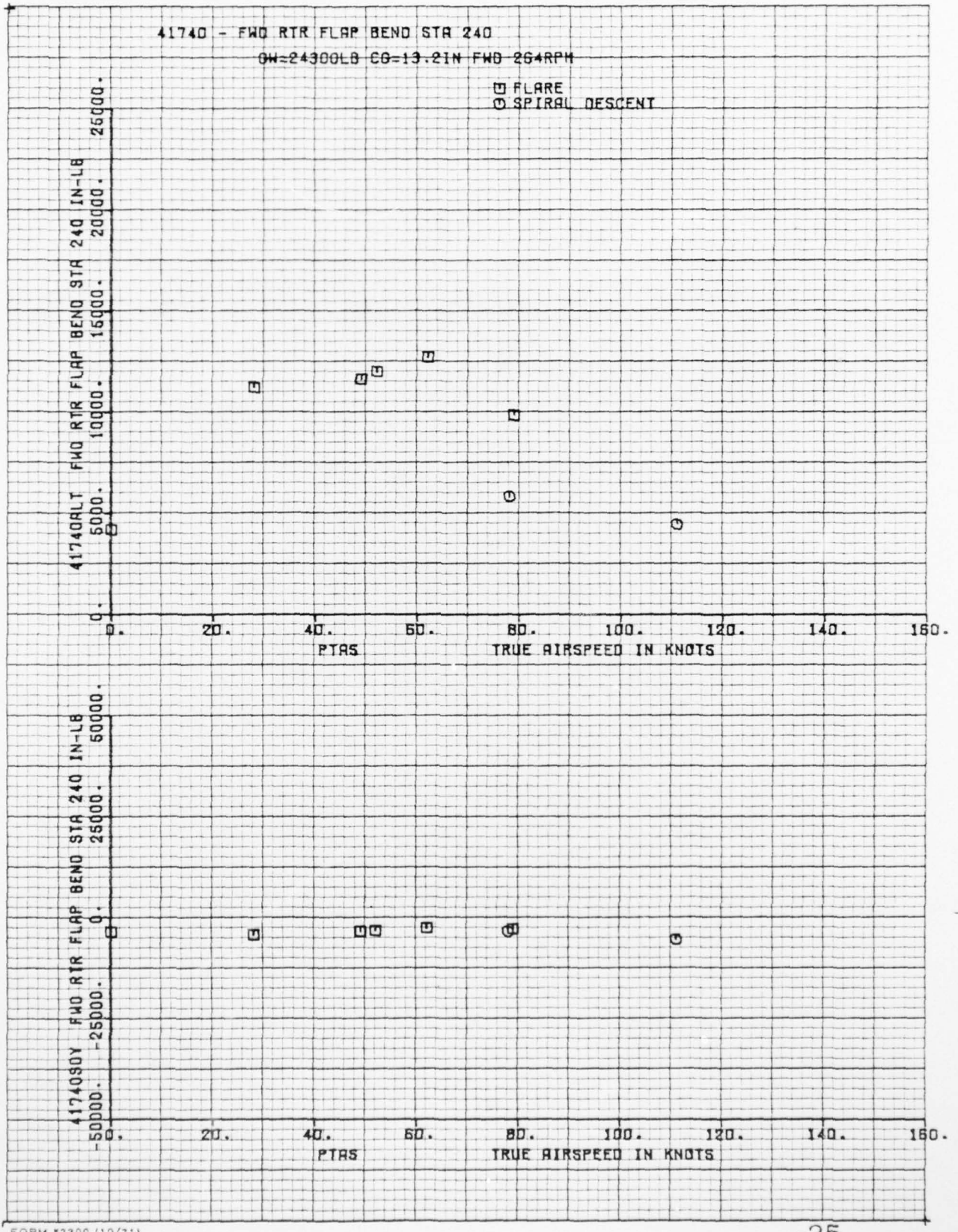


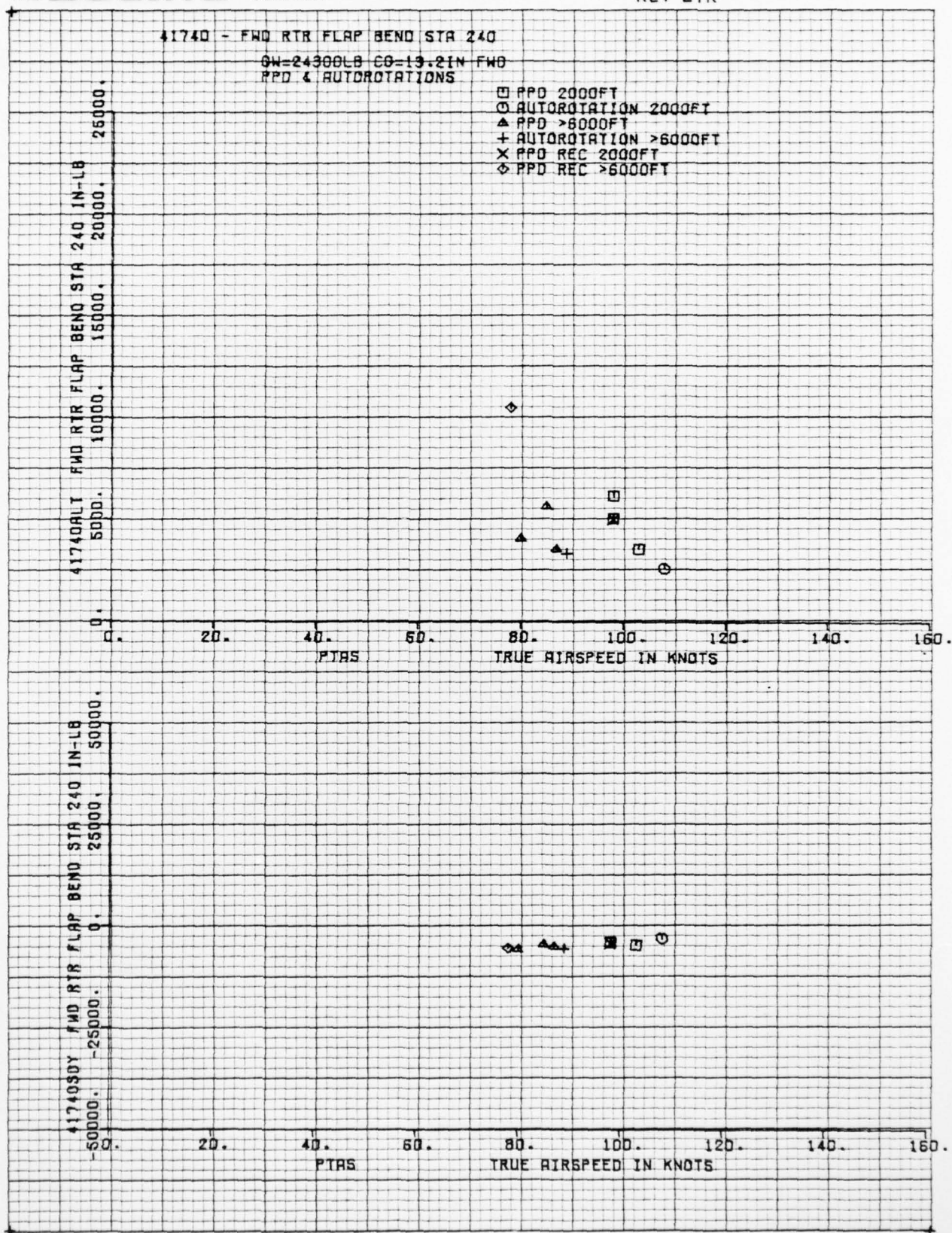
THE **BOEING** COMPANY

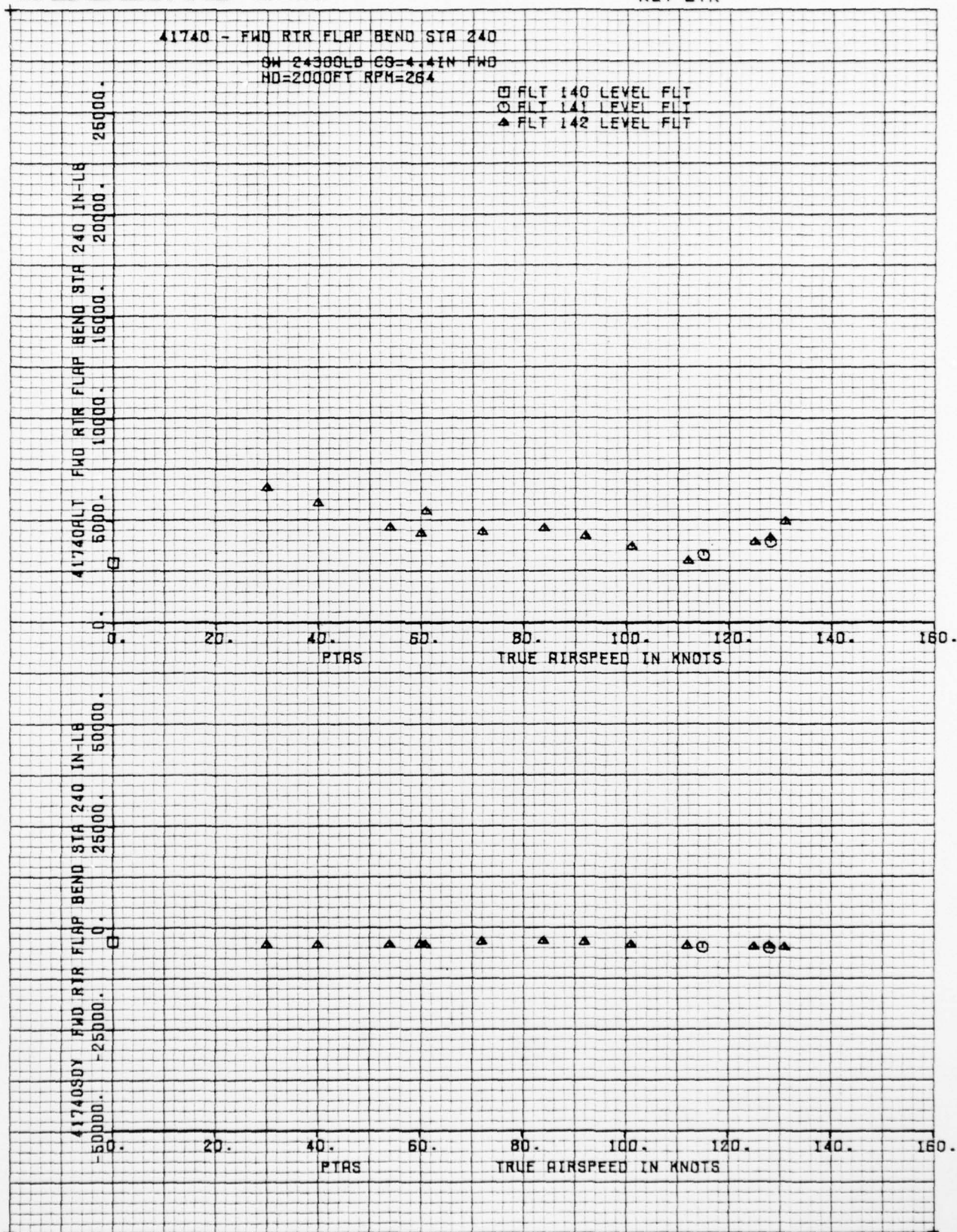
FORM 52300 (10/71)

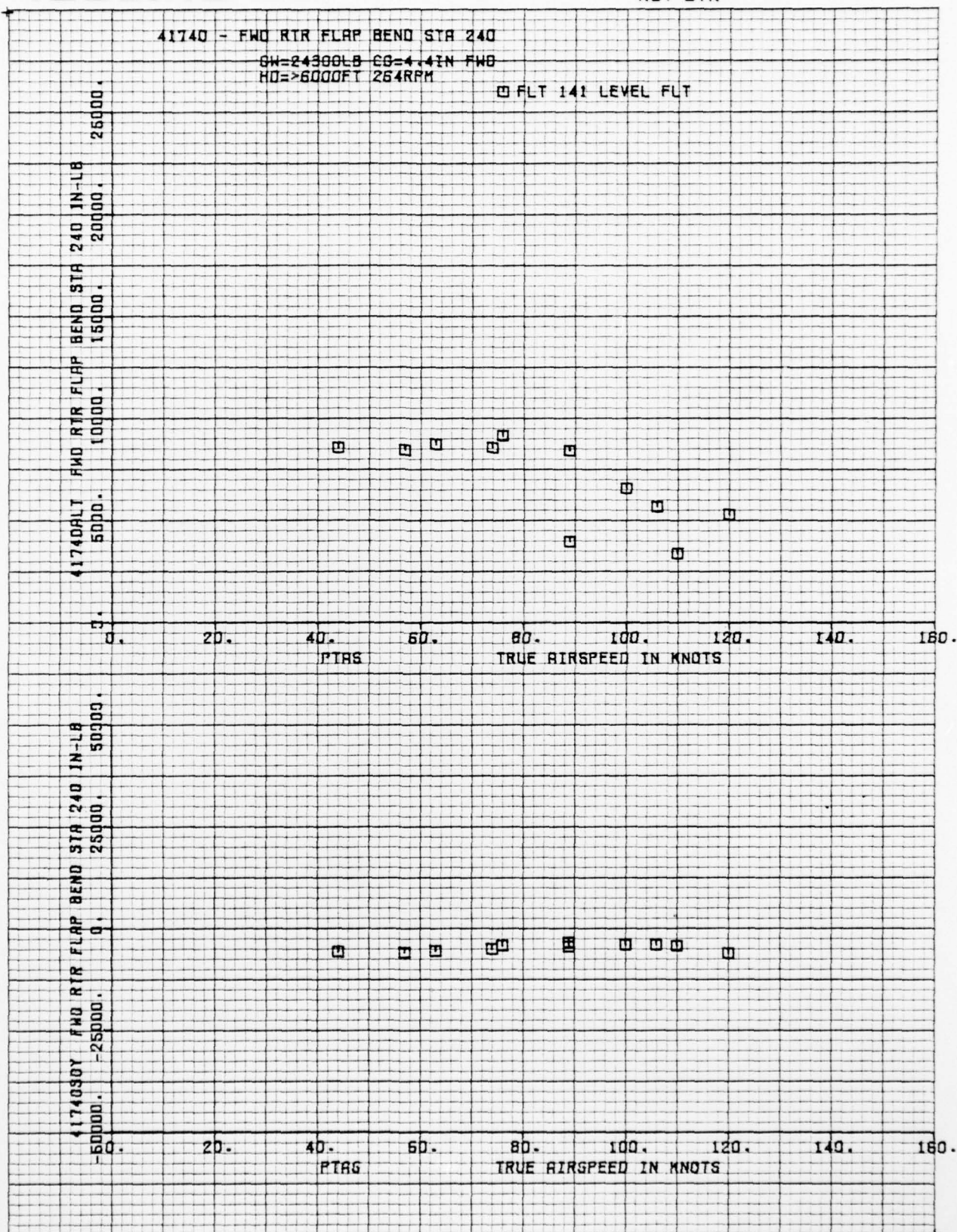
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FORM 52300 (10/71)

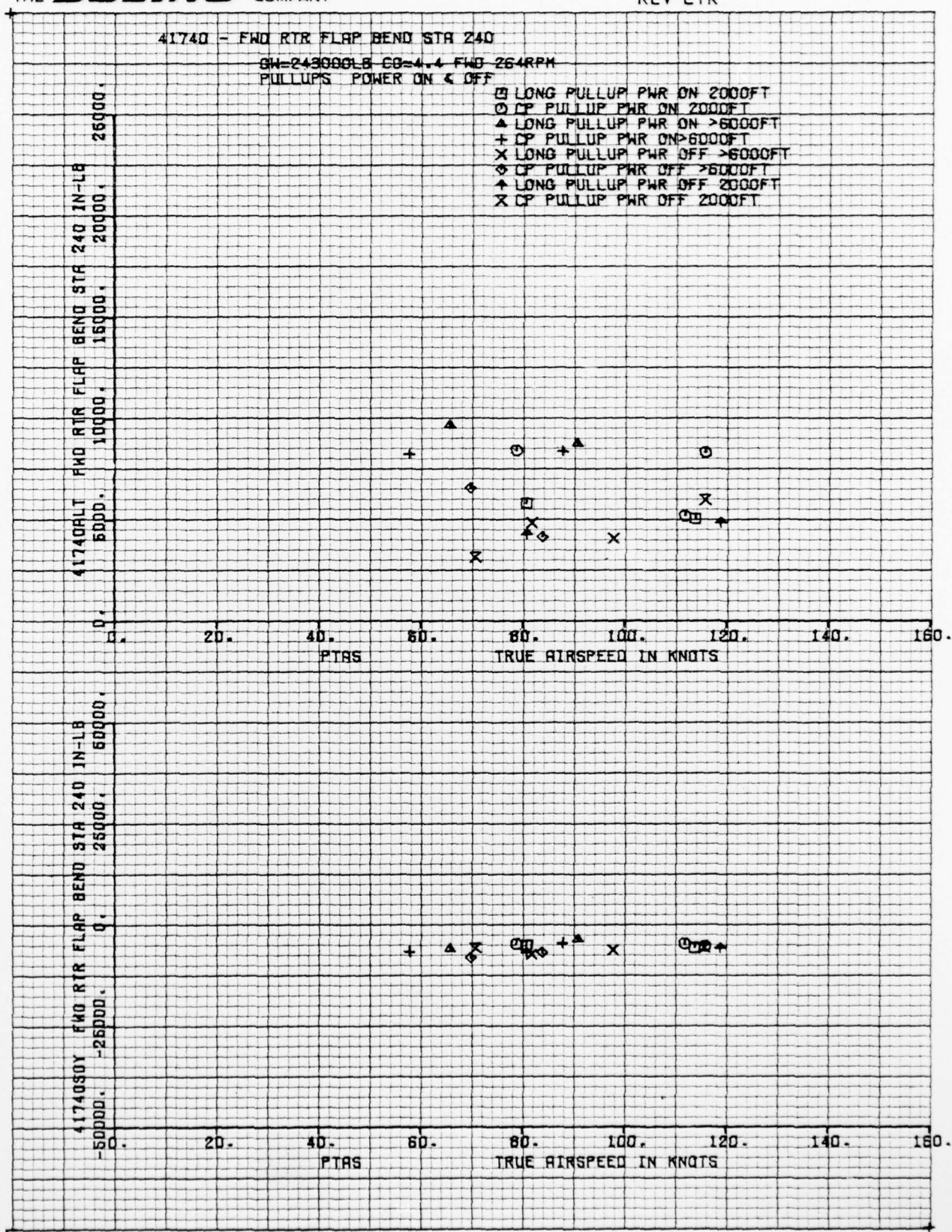


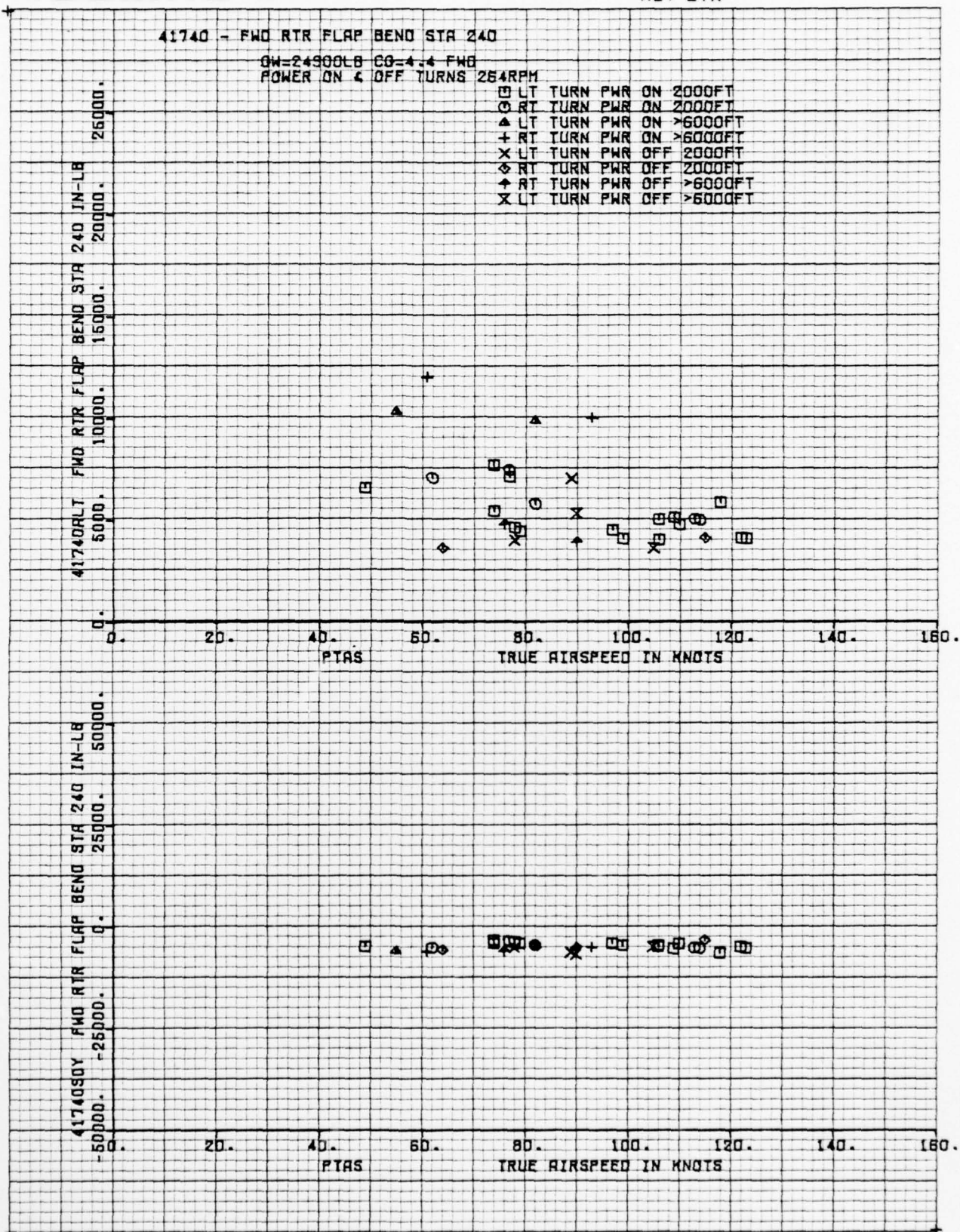
THE **BOEING** COMPANY



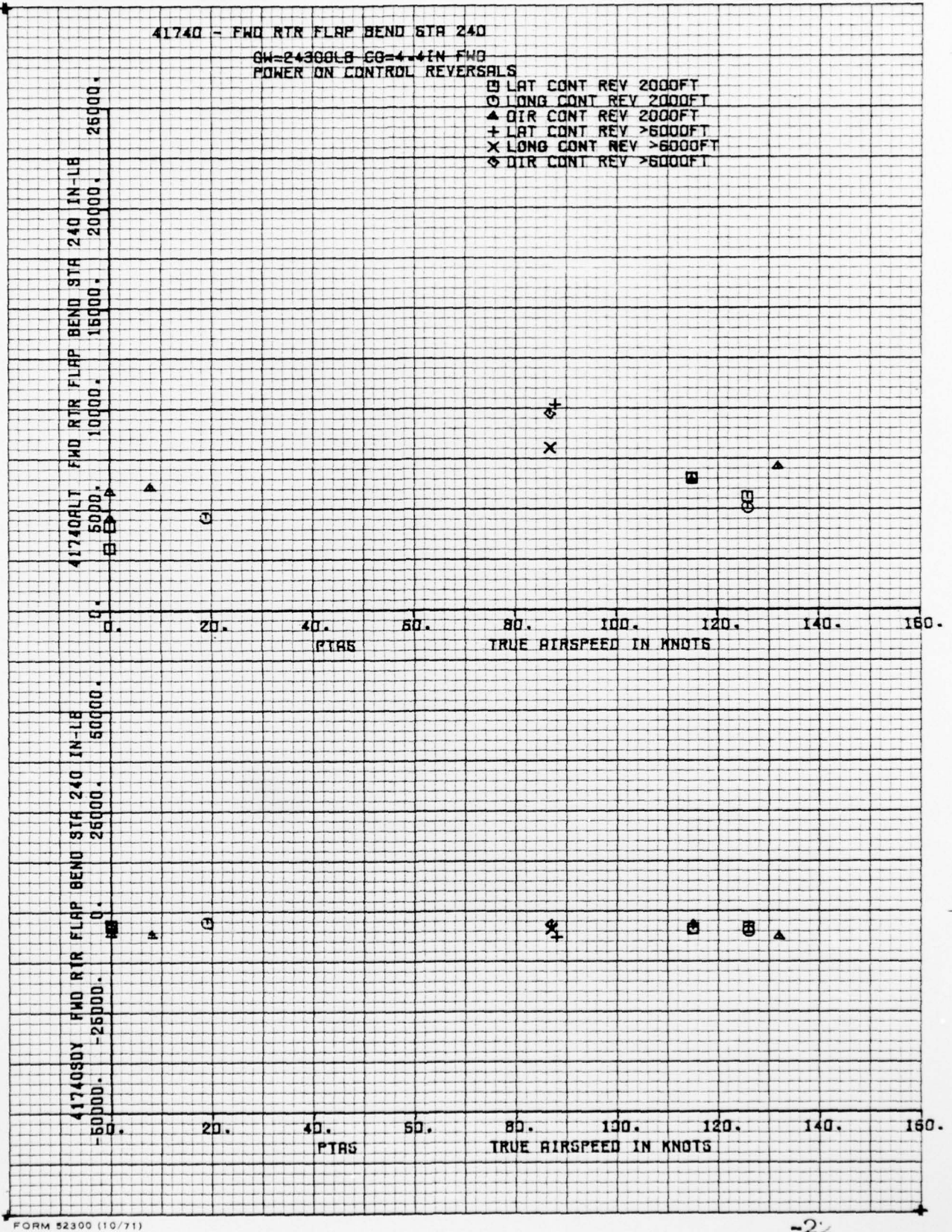
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FORM 52300 (10/71)

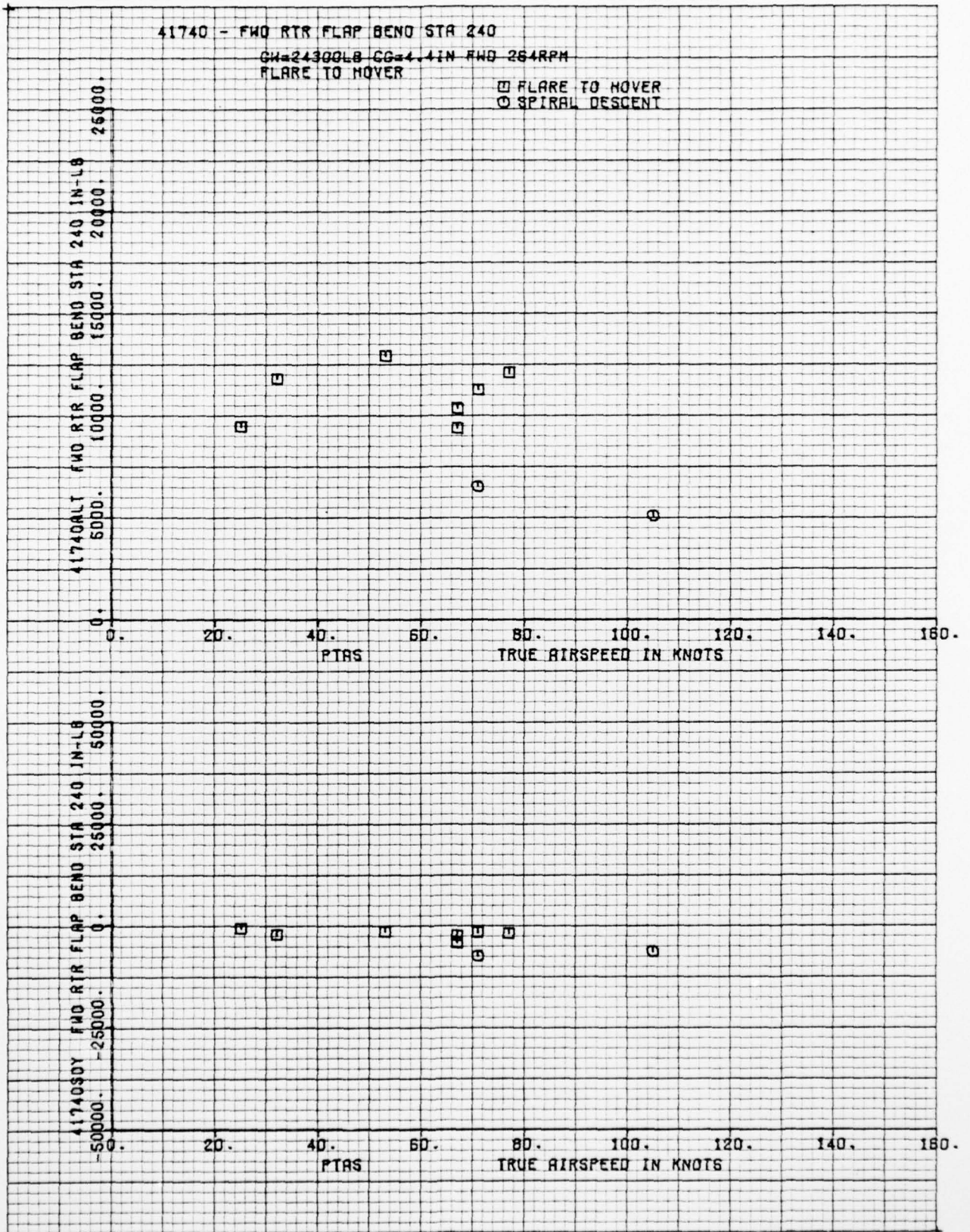
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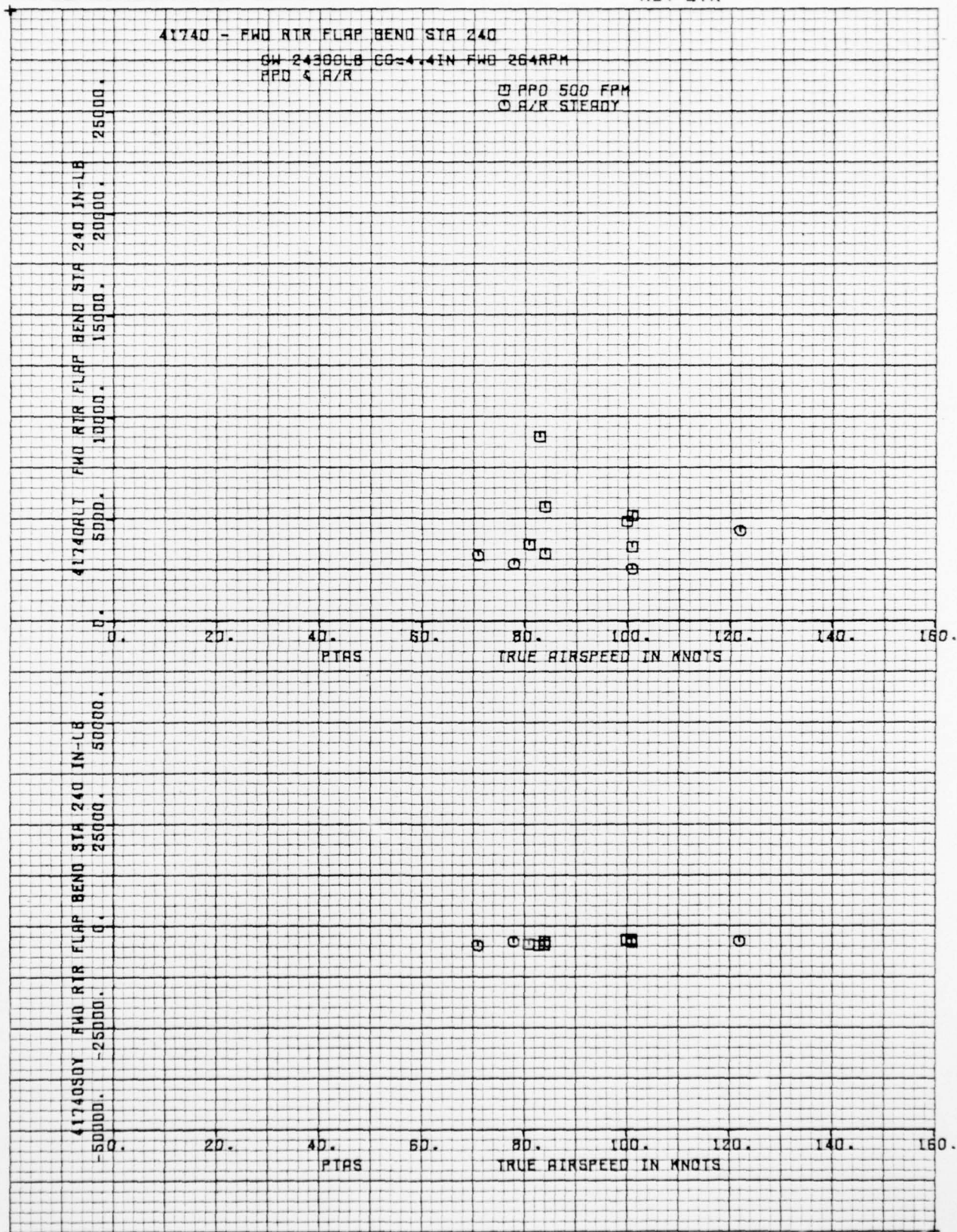
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THE **BOEING** COMPANY

PREPARED BY: J. Bendo

CHECKED BY:

DATE: 8/28/78

NUMBER D210-11168-3

REV LTR Volume 2

MODEL NO.

4.9 Forward Blade Flap Bending Station 275.

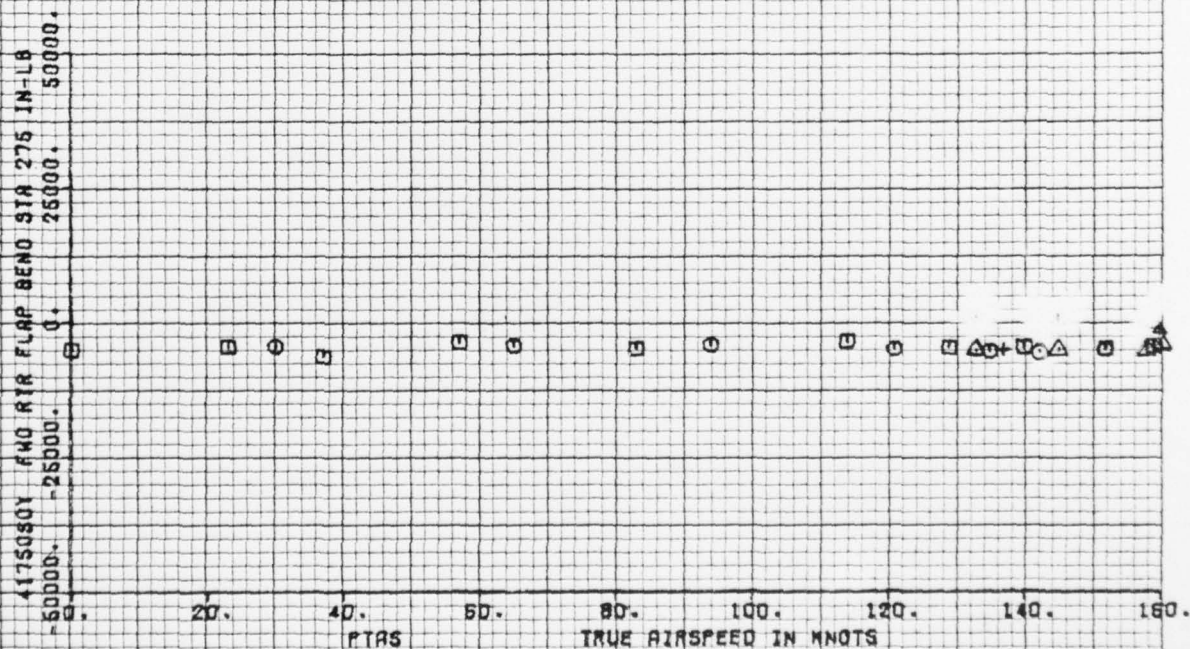
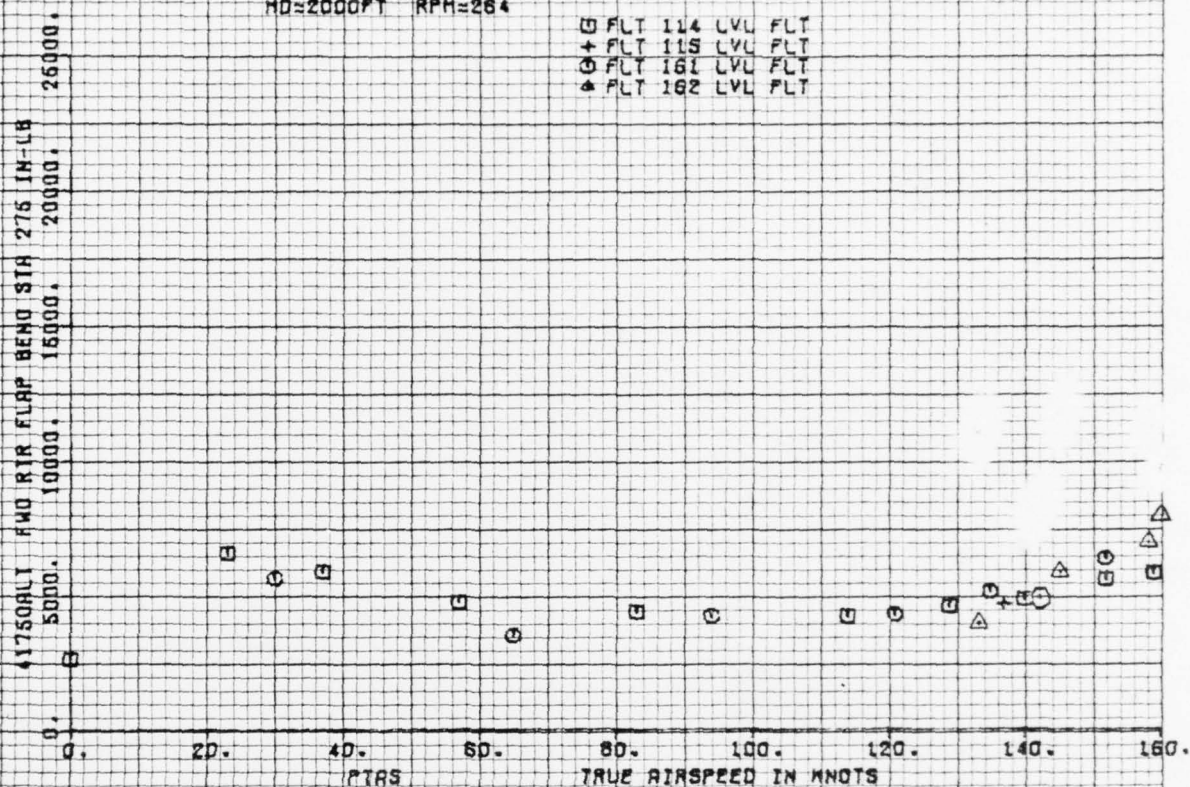
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41750 - FWD RTR FLAP BEND STA 275

GW=20800LB CD=22.4IN FWD

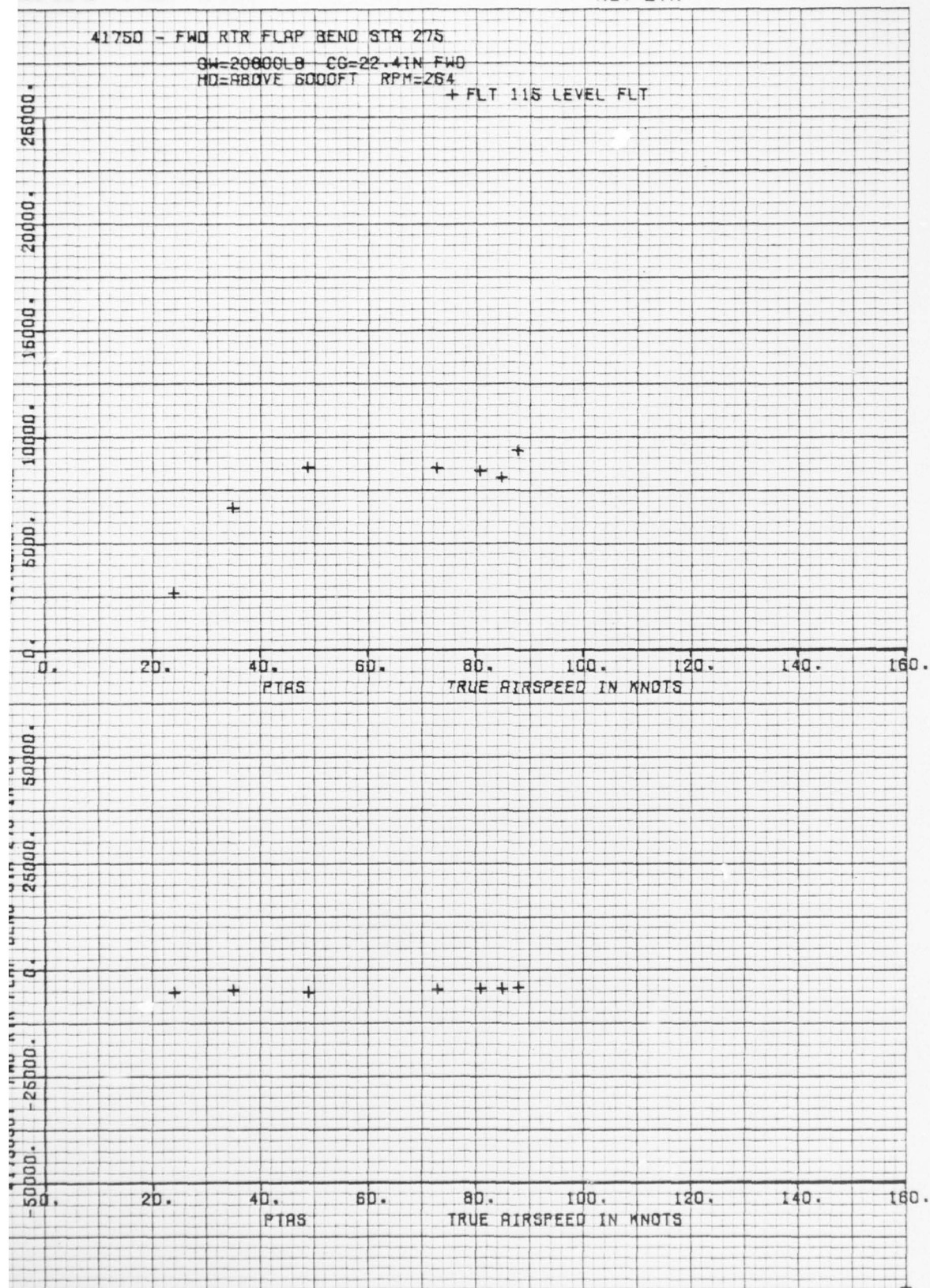
MD=2000FT RPM=264

□ FLT 114 LVL FLT
 + FLT 115 LVL FLT
 ○ FLT 161 LVL FLT
 △ FLT 162 LVL FLT



DEING COMPANY

D210-11168-3
NUMBER VOLUME 2
REV LTR



00 (10/71)

SHEET 287

-2

AD-A075 570

BOEING VERTOL CO PHILADELPHIA PA

F/0 1/3

CH-46 COMPOSITE ROTOR BLADE FLIGHT STRESS SURVEY DATA. VOLUME I--ETC(U)

1978 R AIELLO, J BENDO

N00019-75-C-0396

UNCLASSIFIED

D210-11160-3-VOL-2

NL

4 OF 4

AD
A075570



END

DATE

FILMED

11-79

DDC

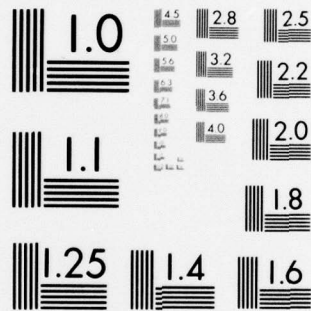
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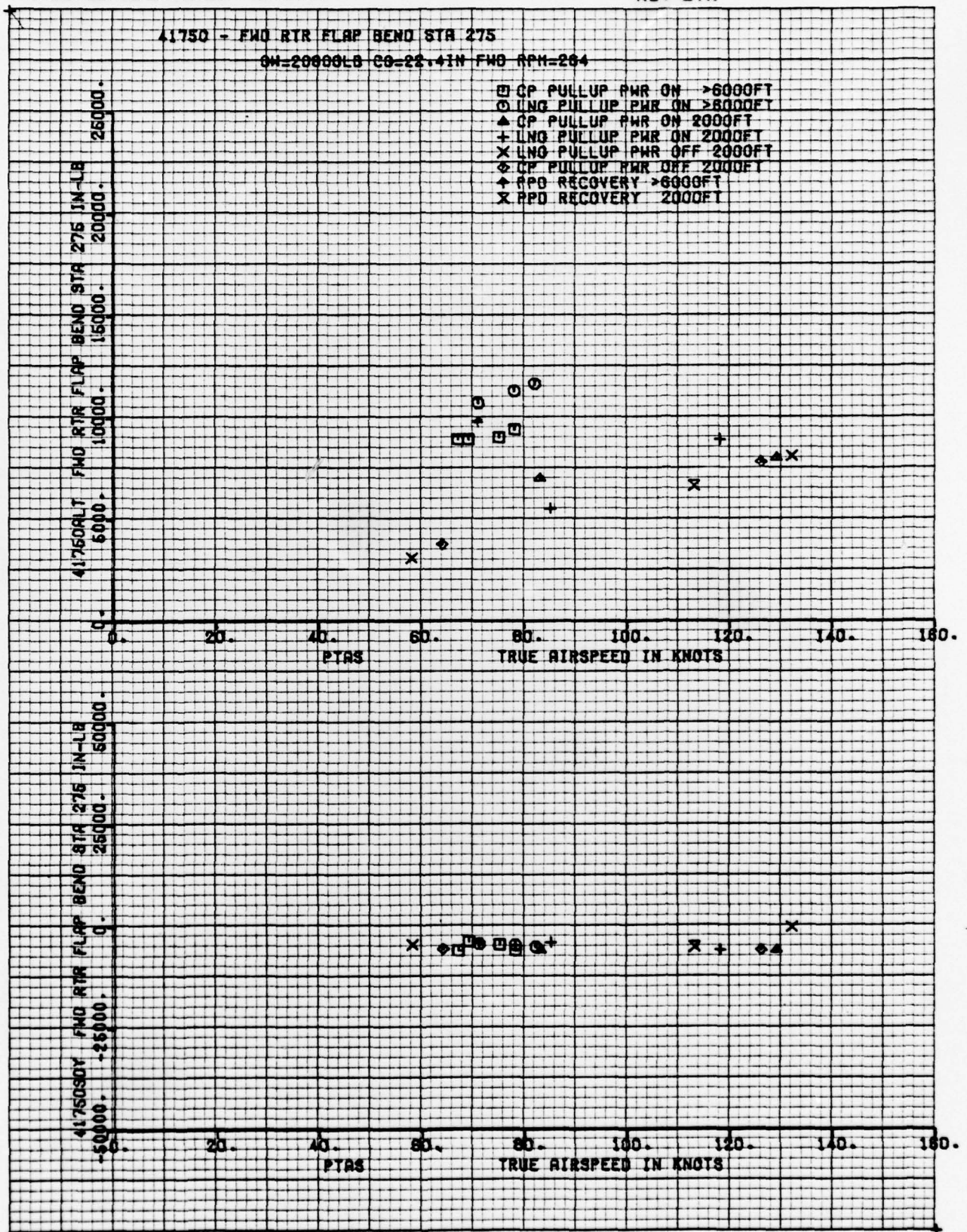
DATE

FILMED

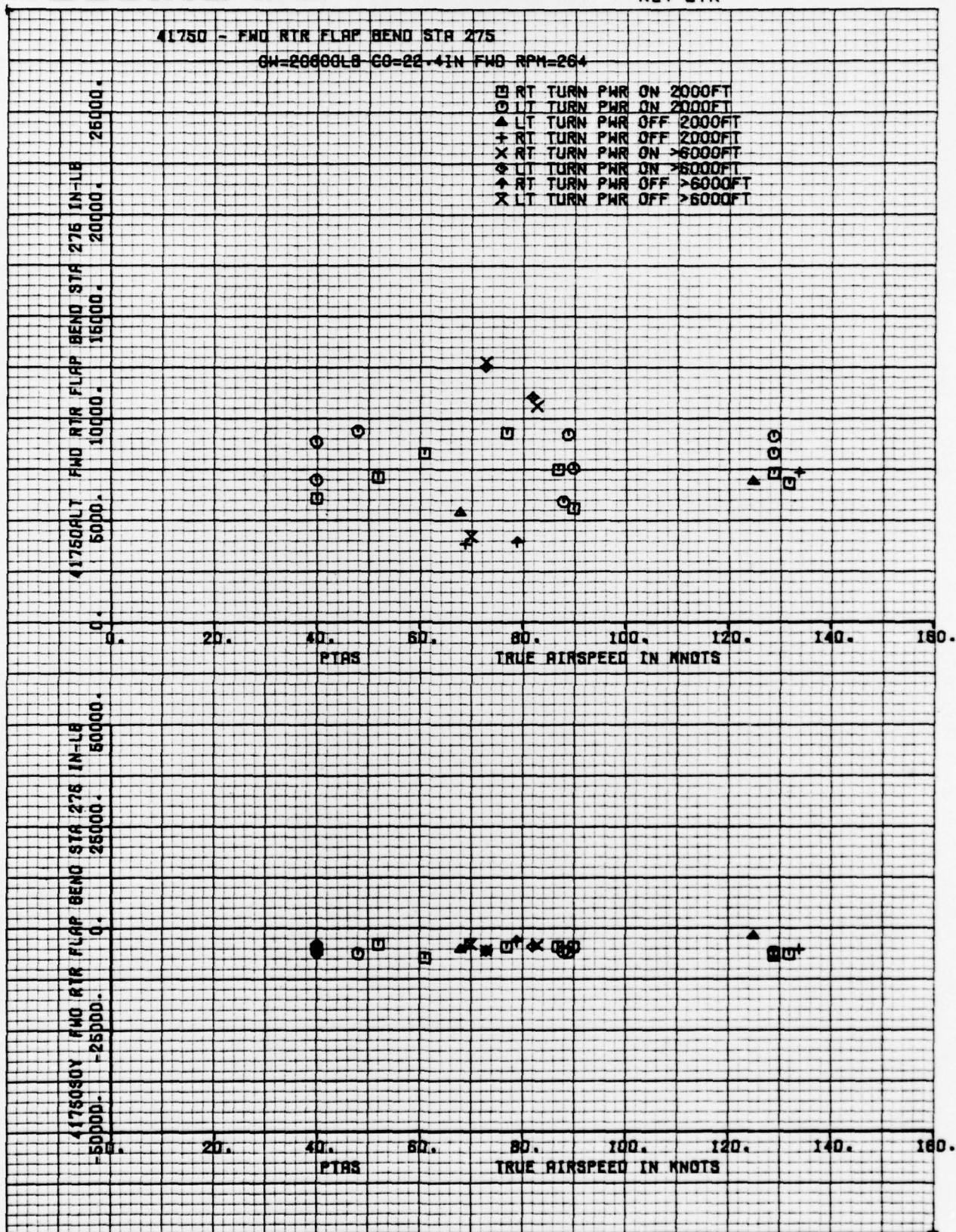
11-79

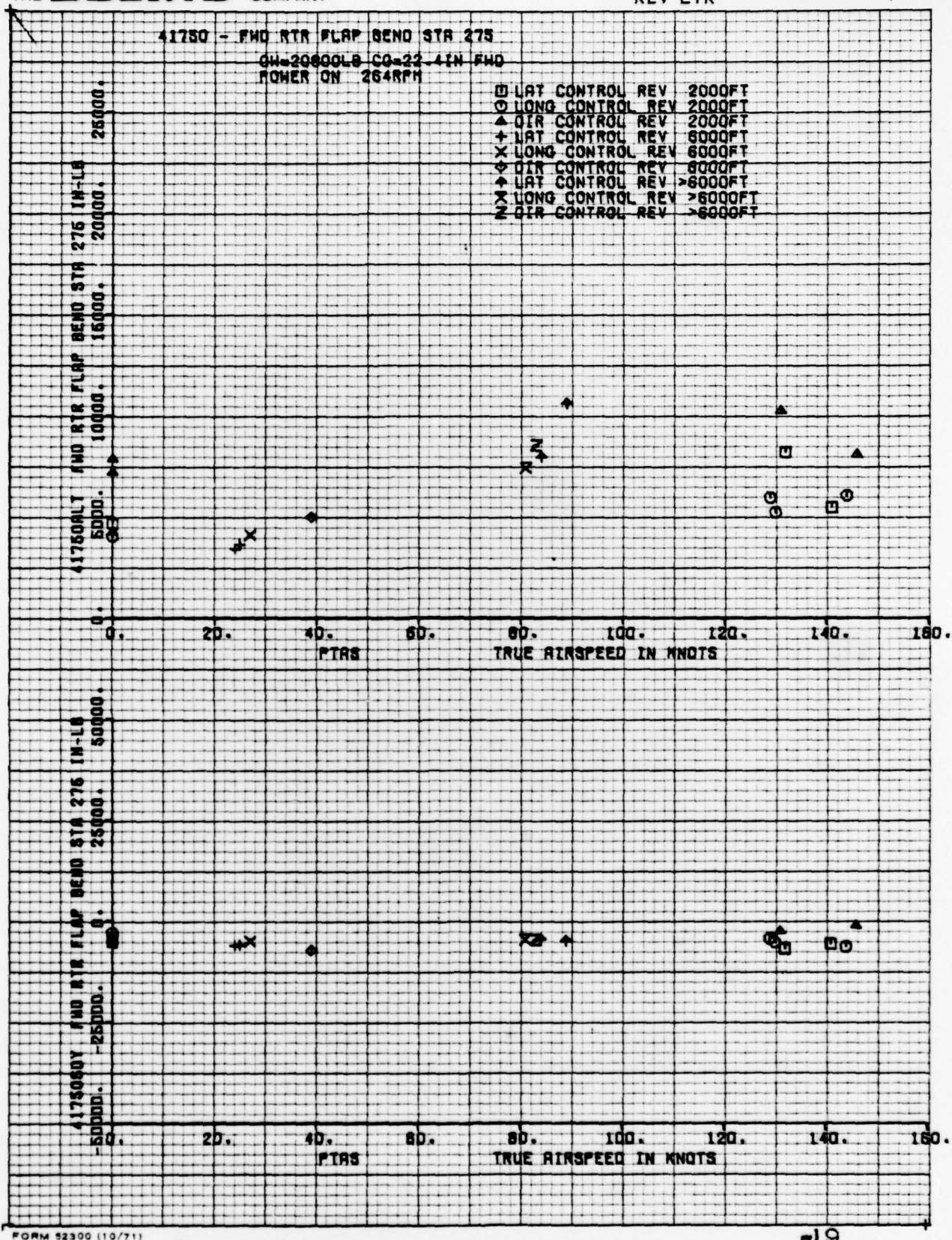
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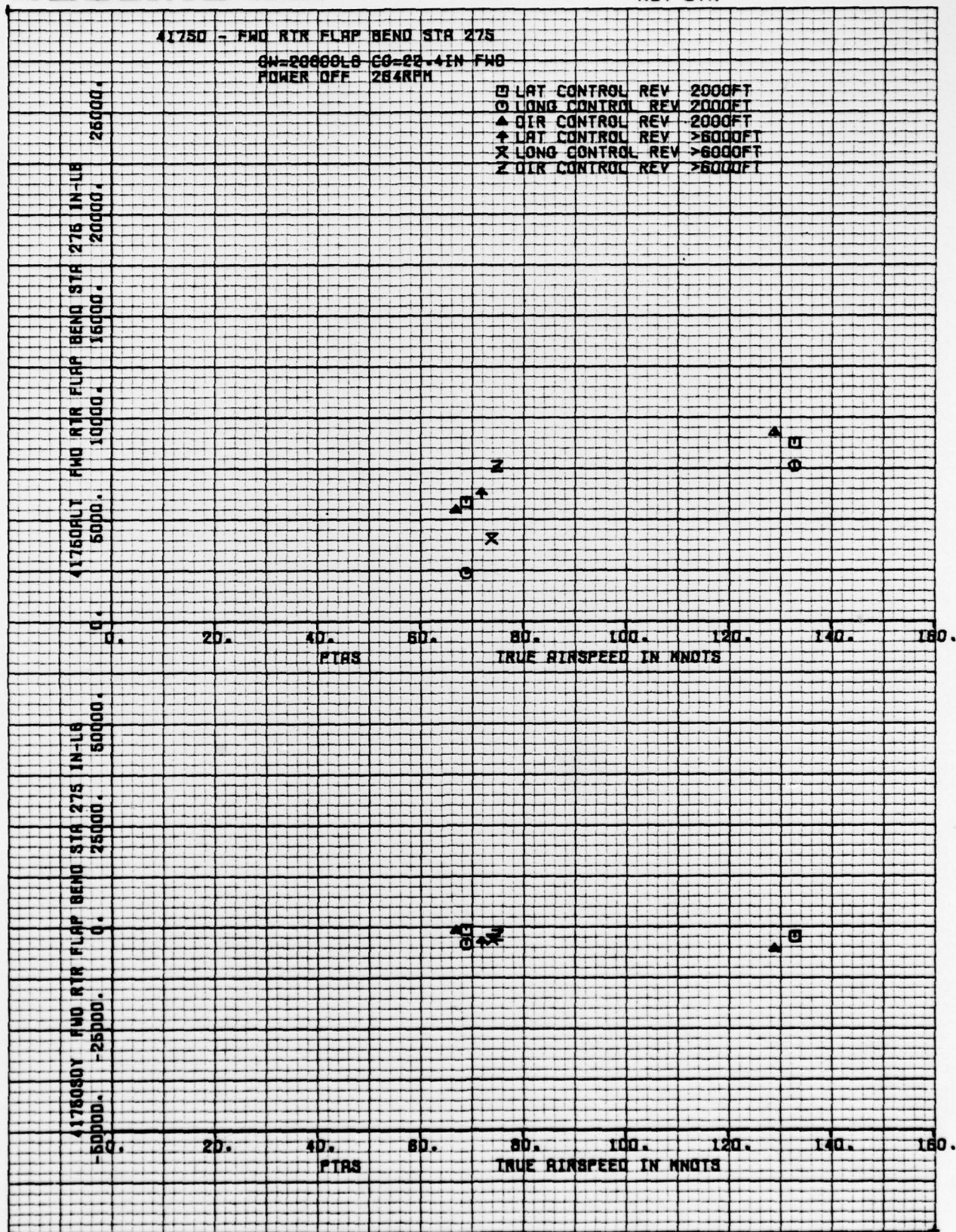


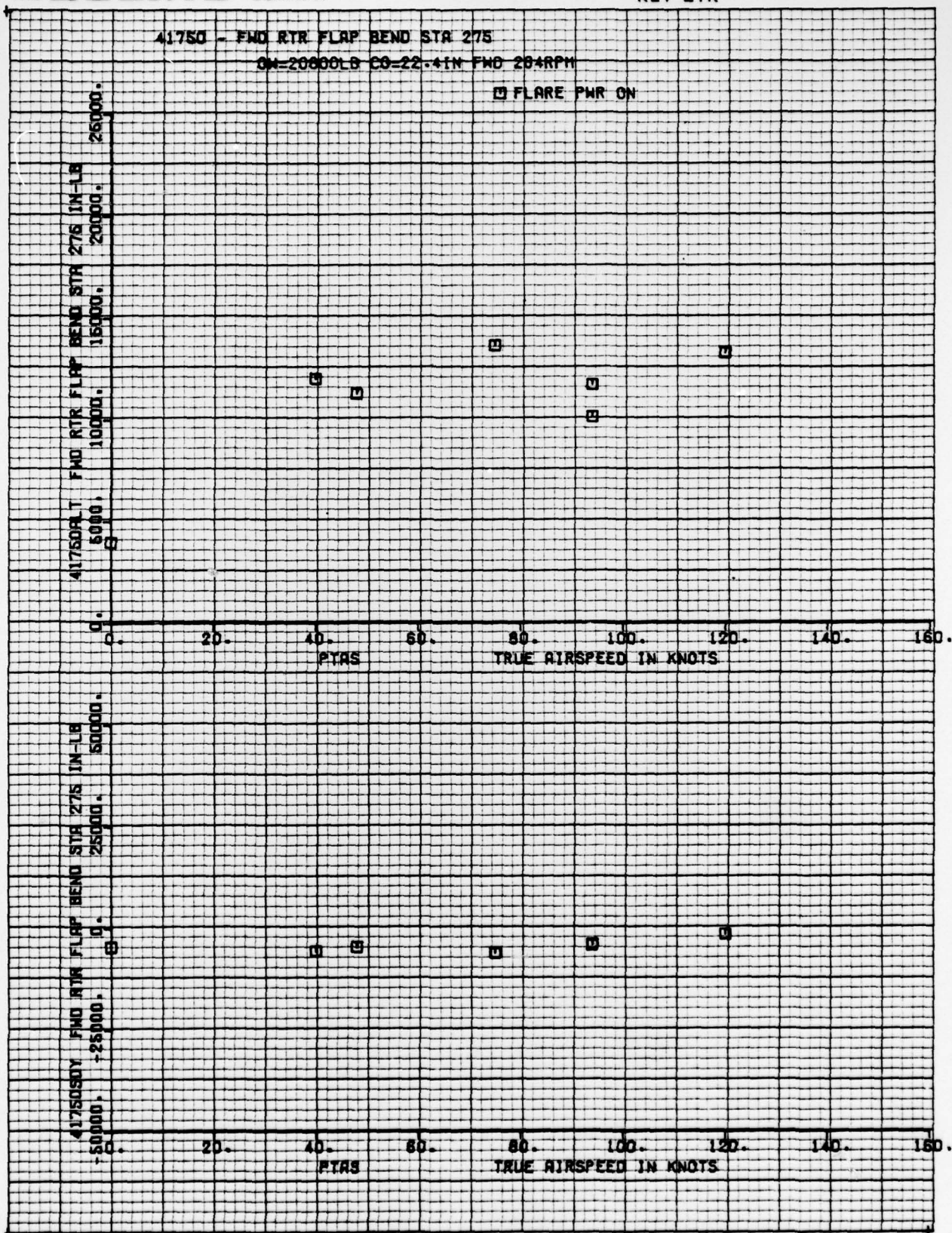
THE **BOEING** COMPANYNUMBER **VOLUME 2**
REV LTR

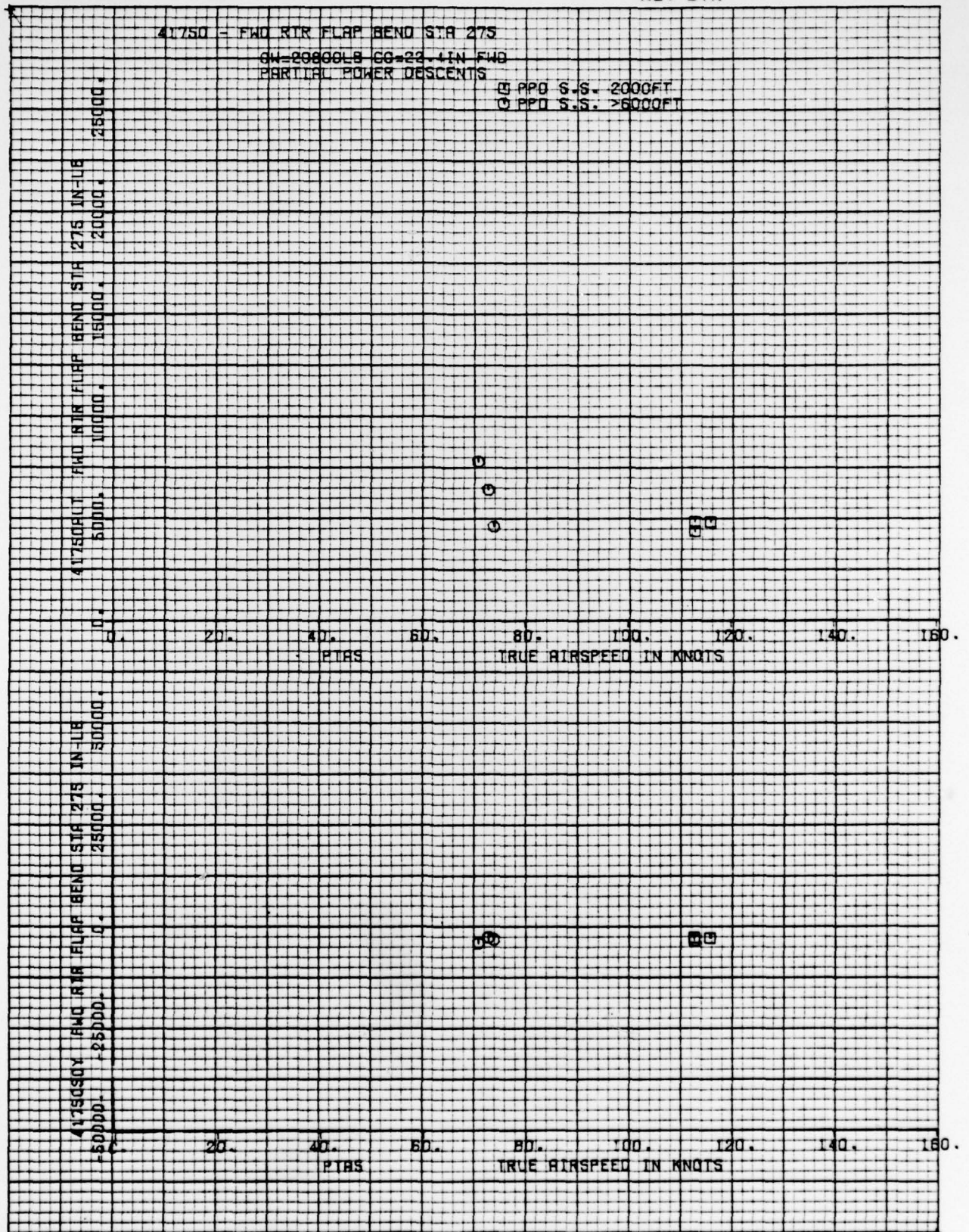
FORM 52300 (10/71)

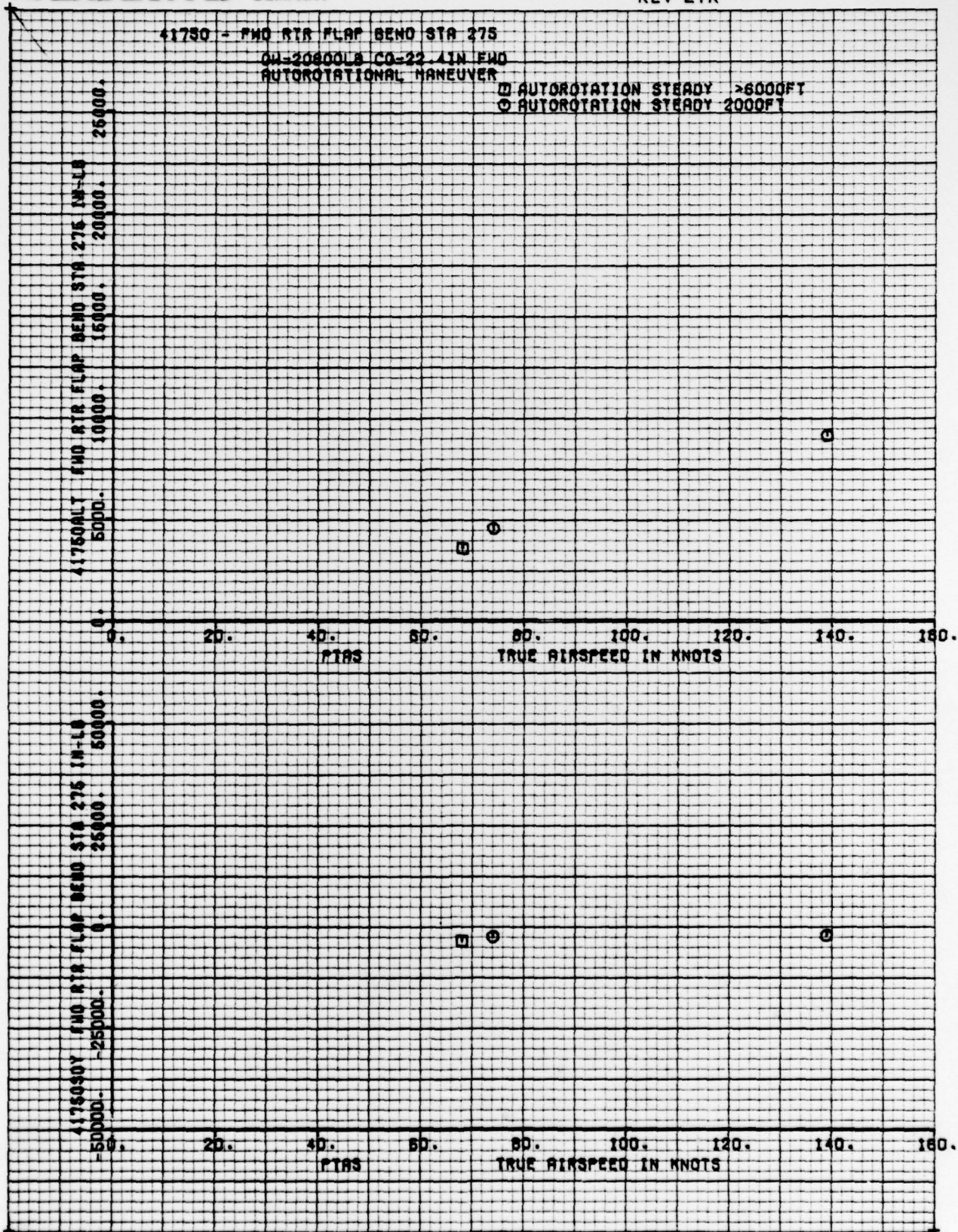


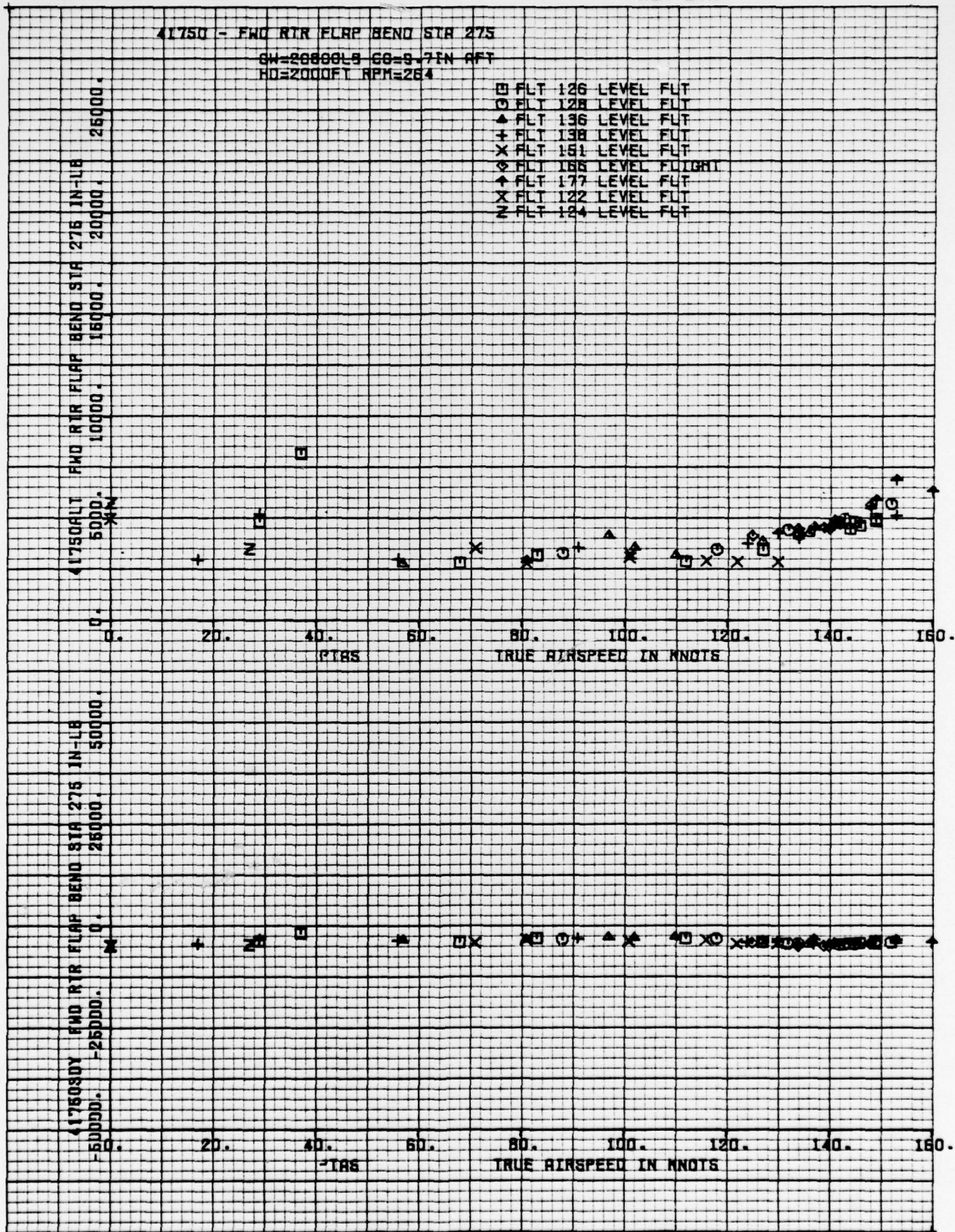


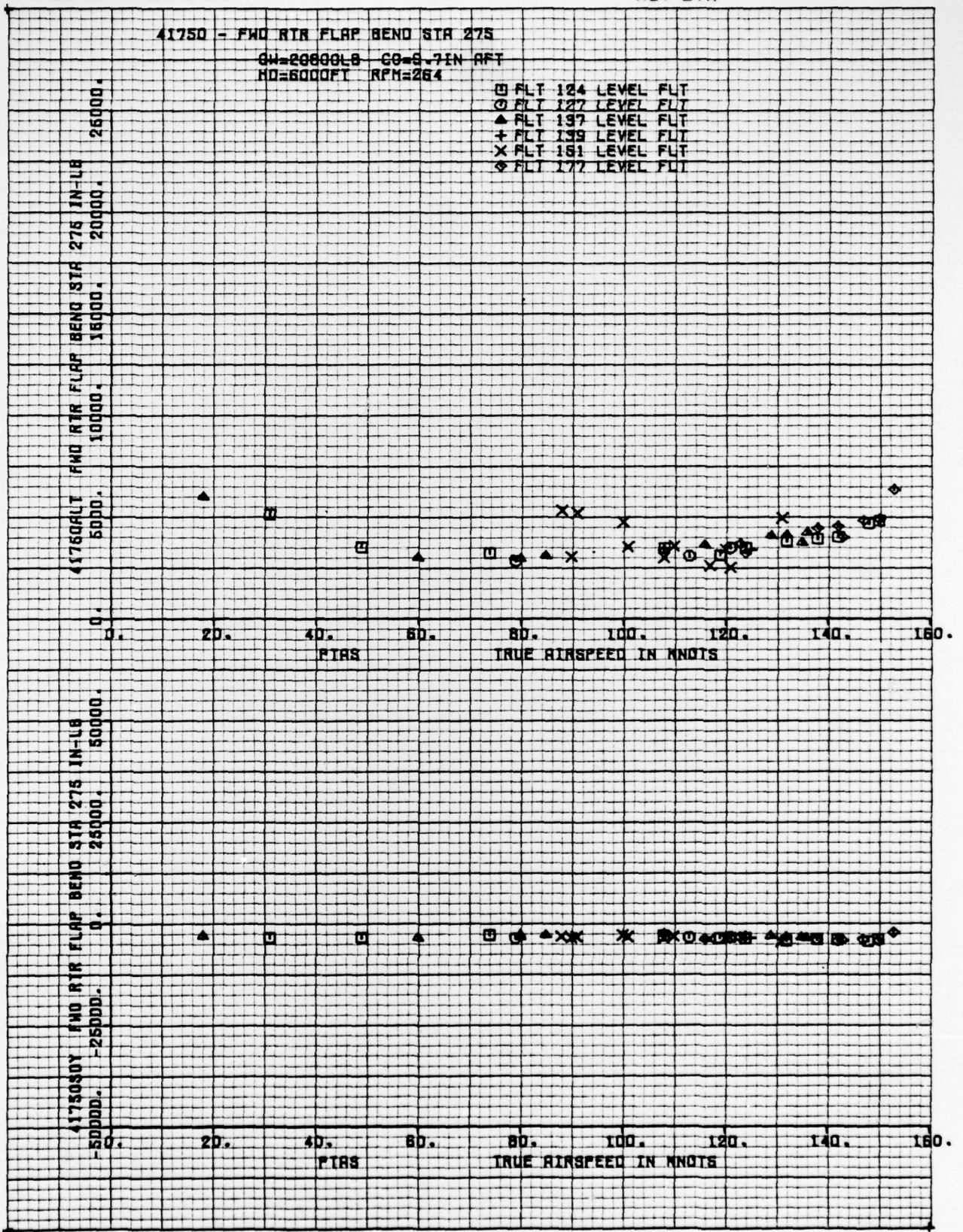








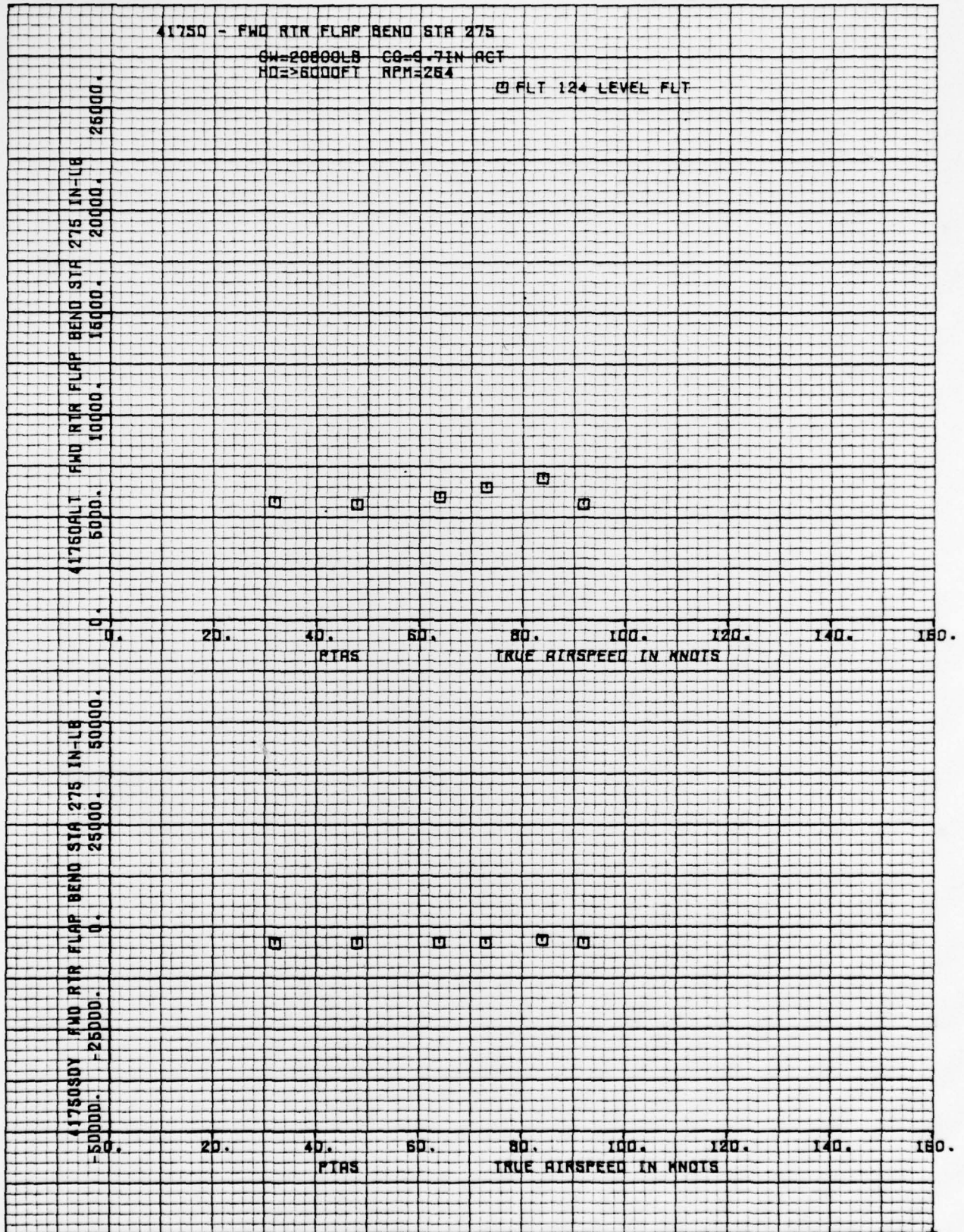


THE **BOEING** COMPANYNUMBER **VOLUME 2**
REV LTR

FORM 52300 (10/71)

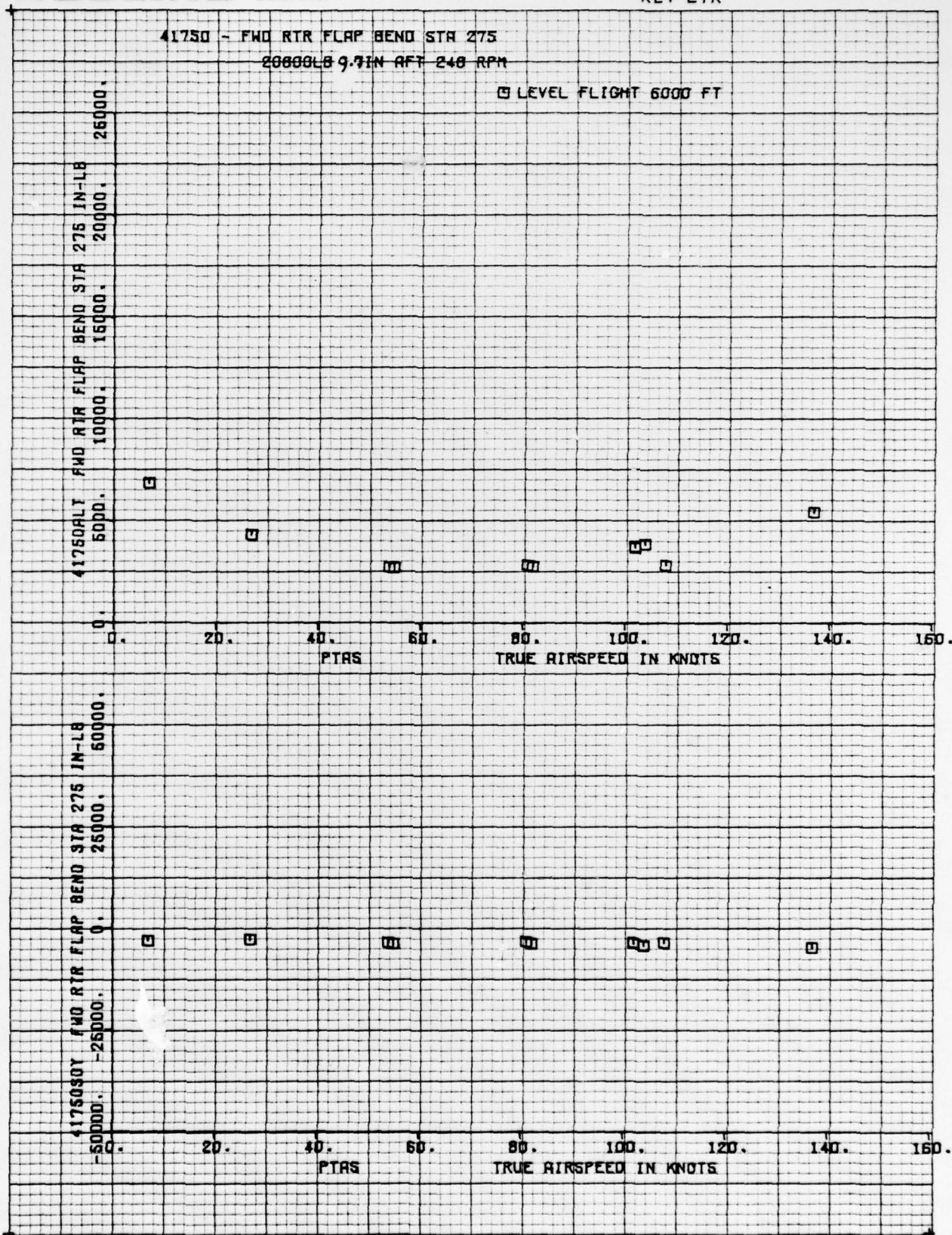
SHEET 296

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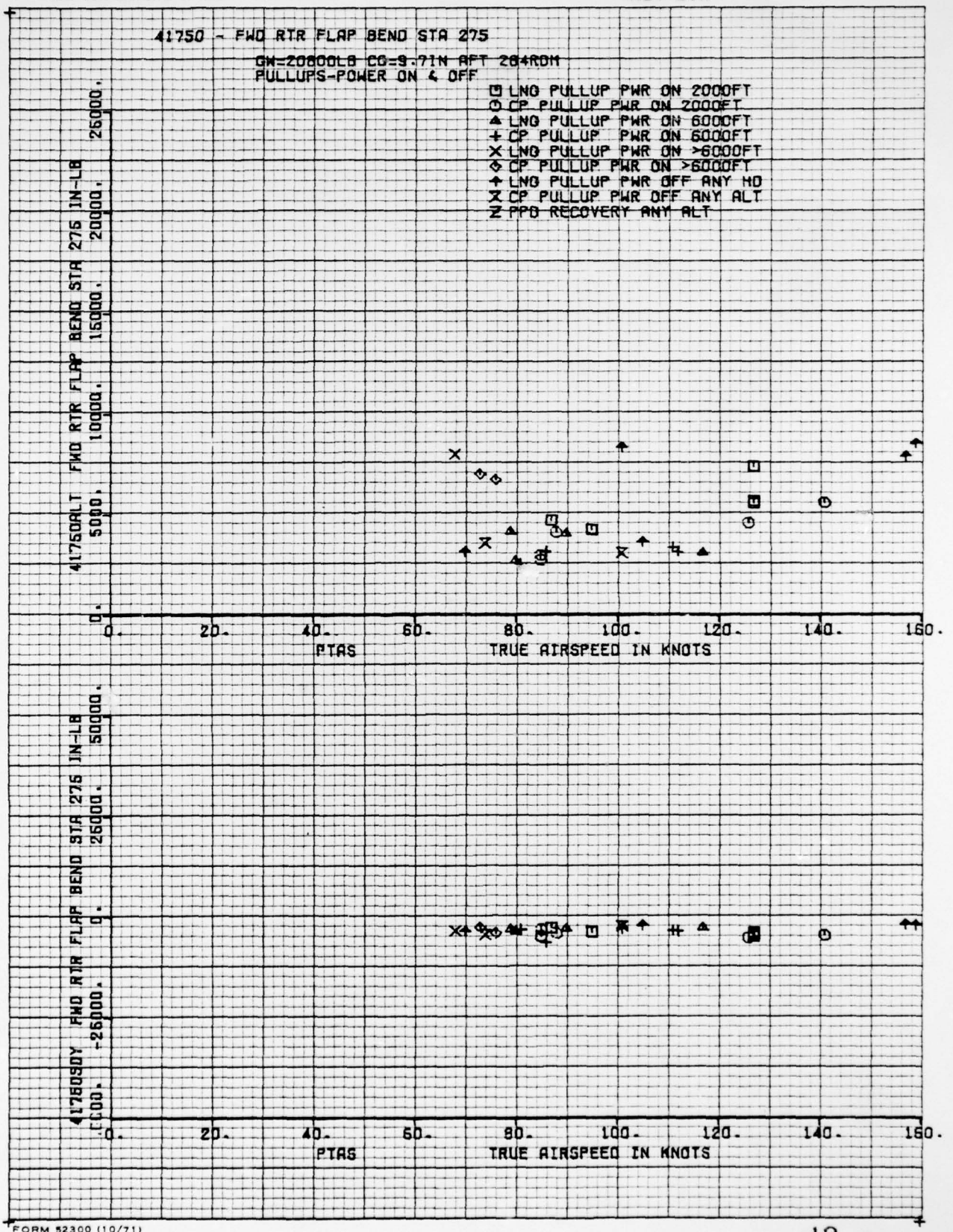
THE **BOEING** COMPANYNUMBER **VOLUME 2**
REV LTR

FORM 52300 (10/71)

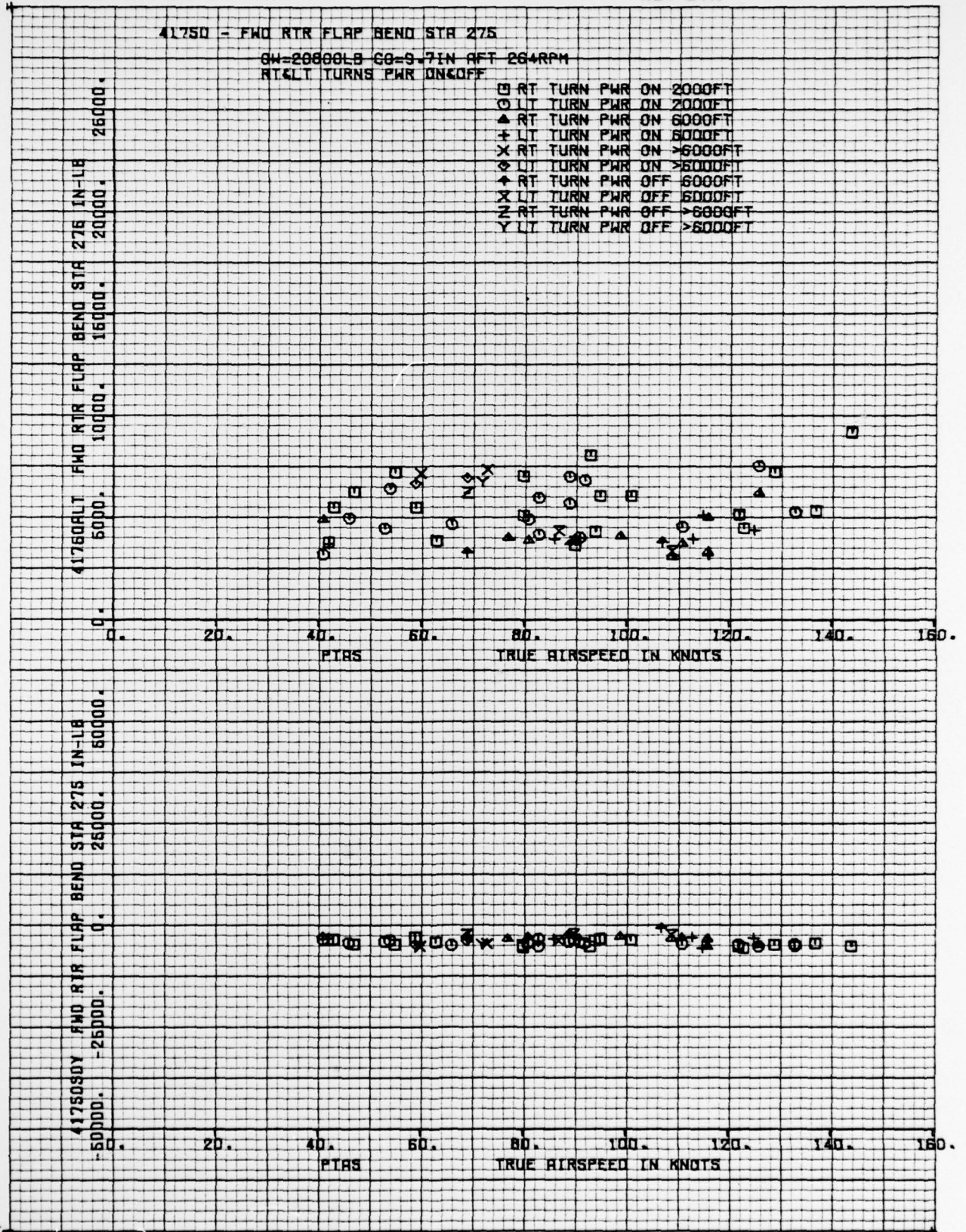
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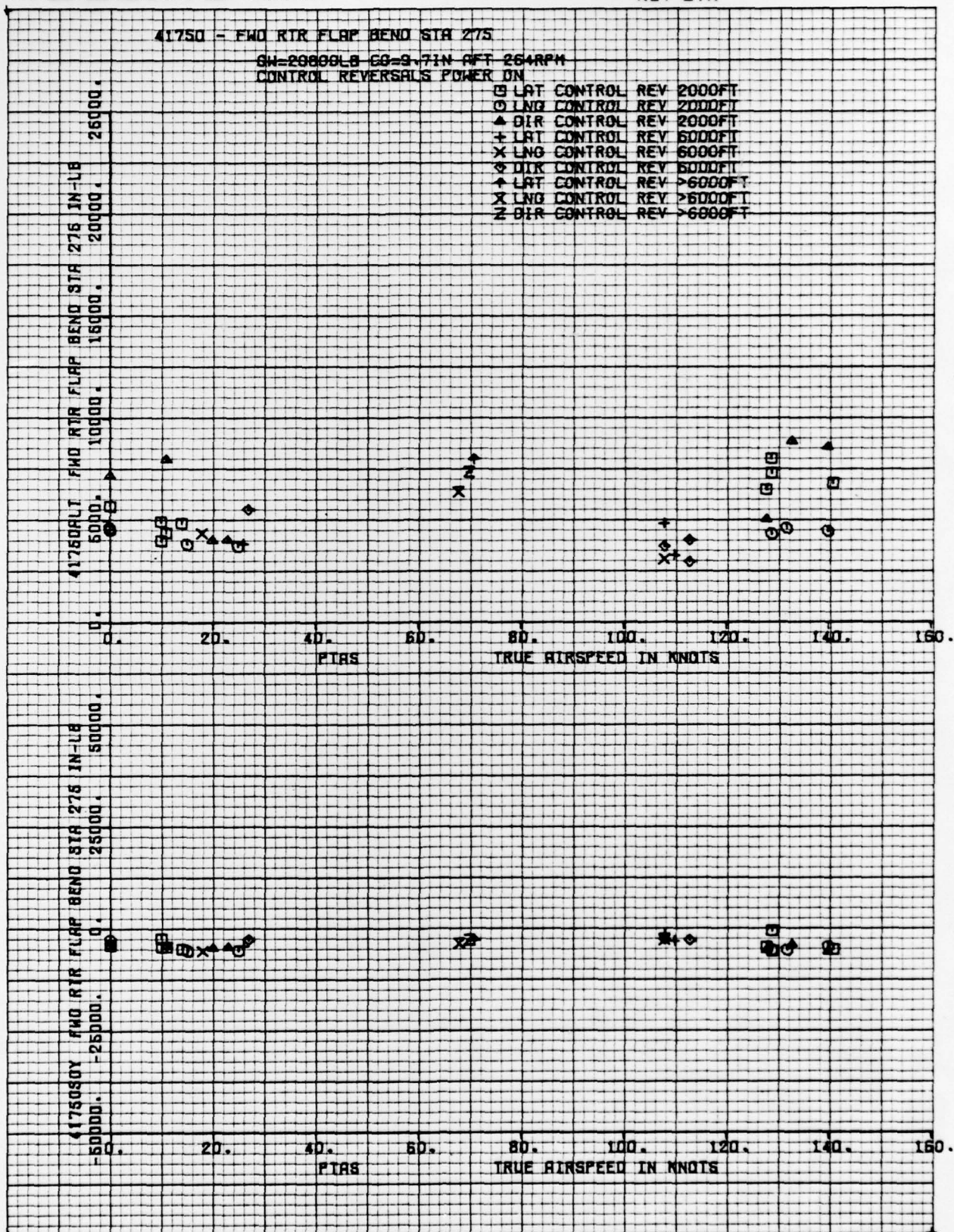
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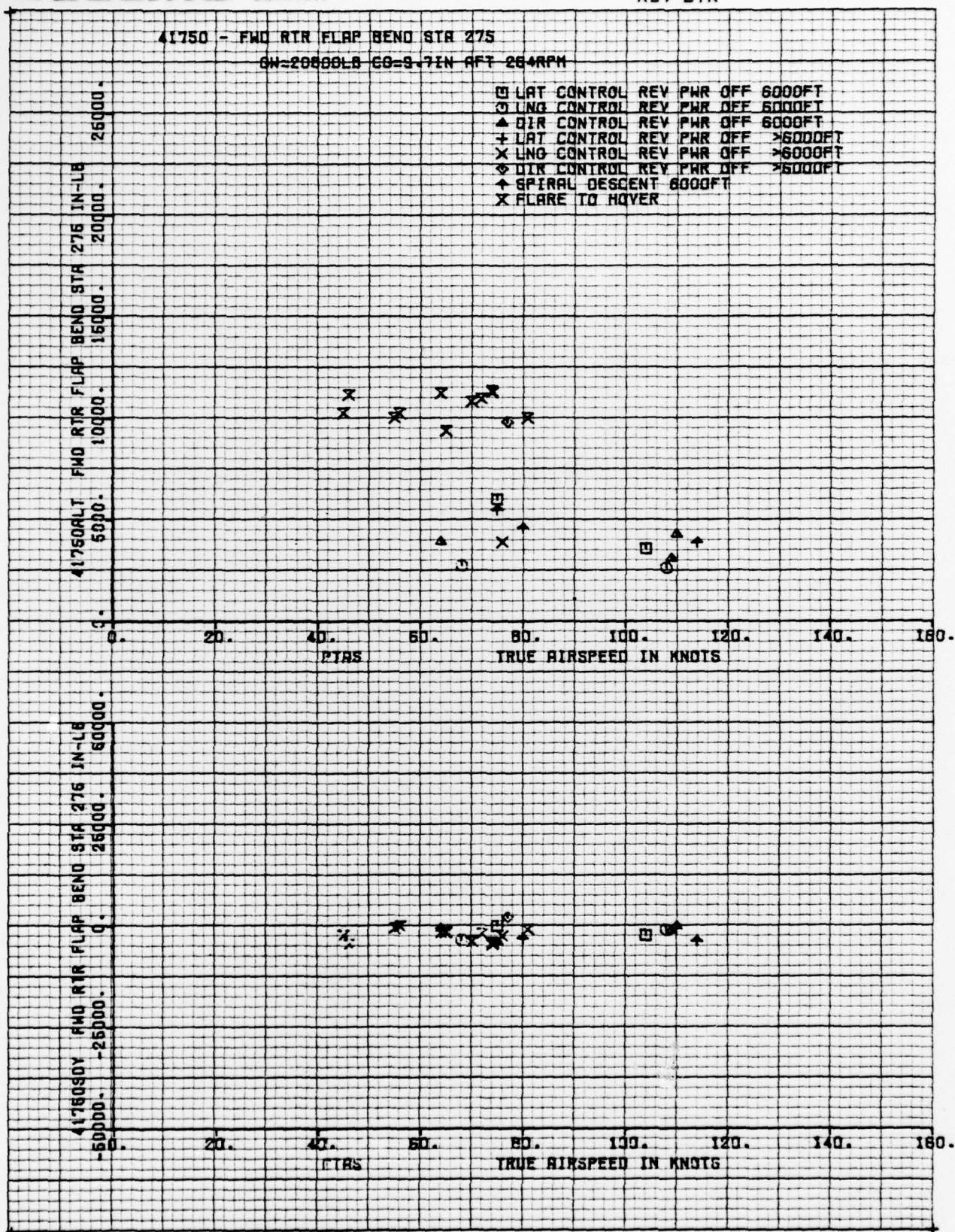
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THE **BOEING** COMPANY

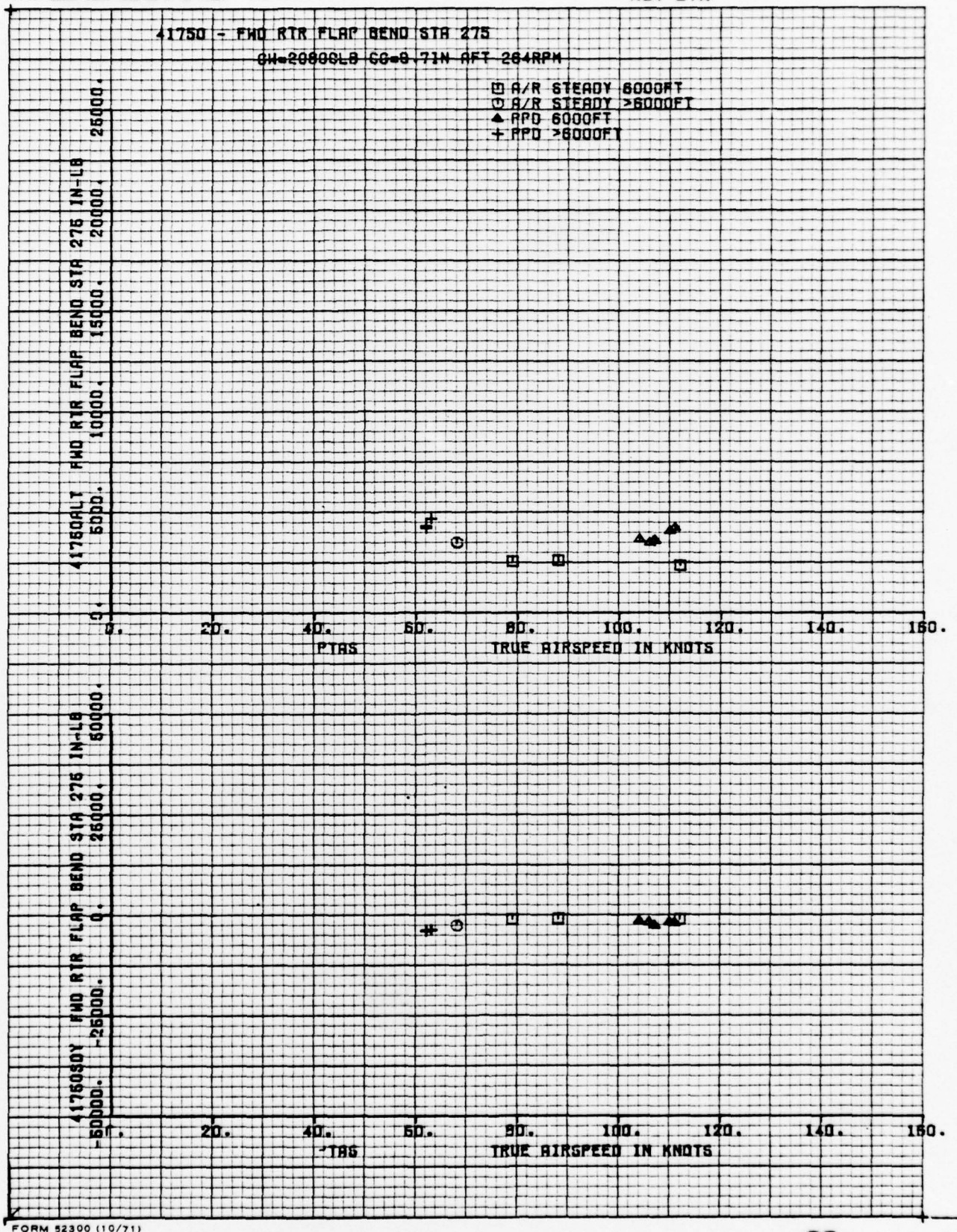


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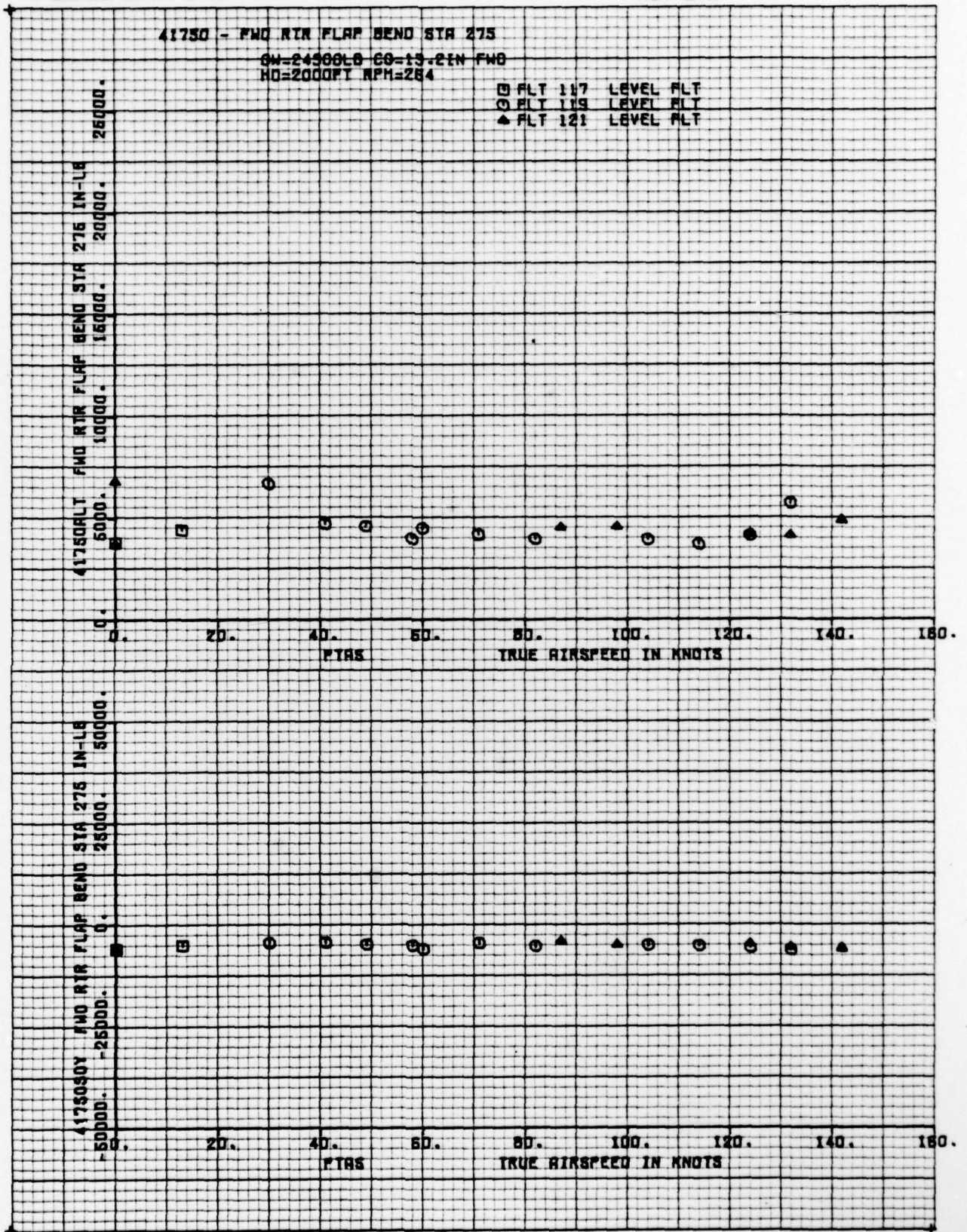


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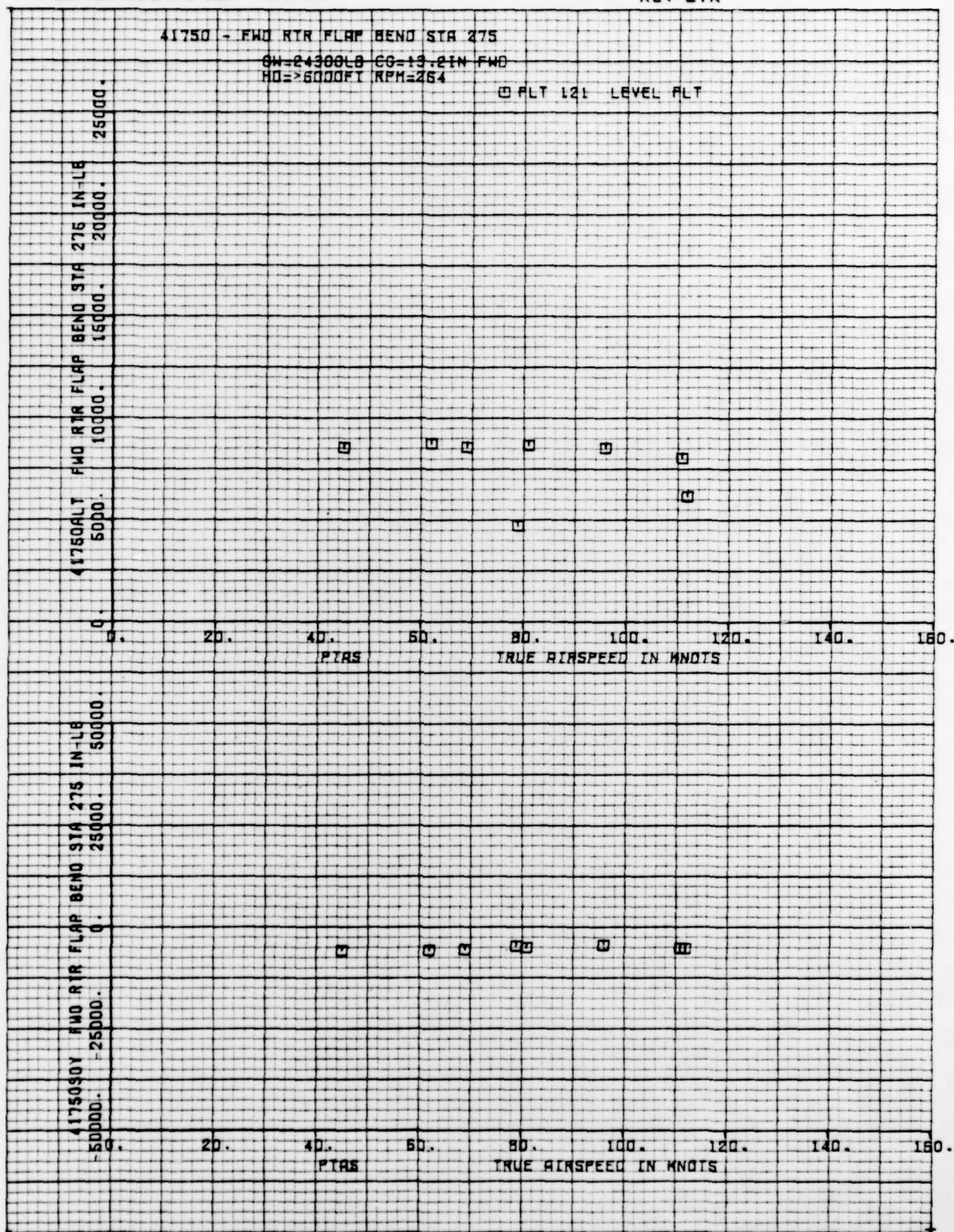
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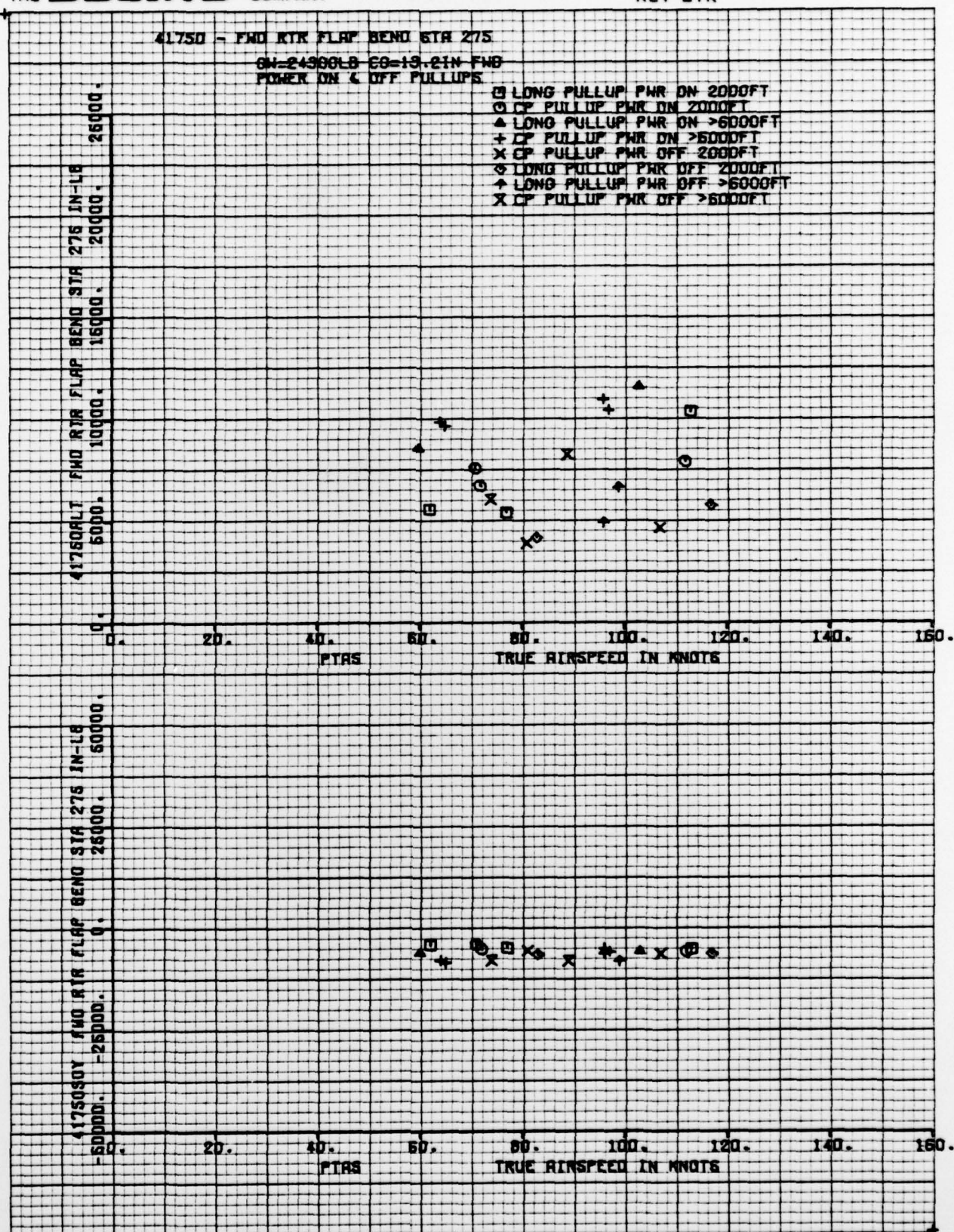
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FORM 52300 (10/71)

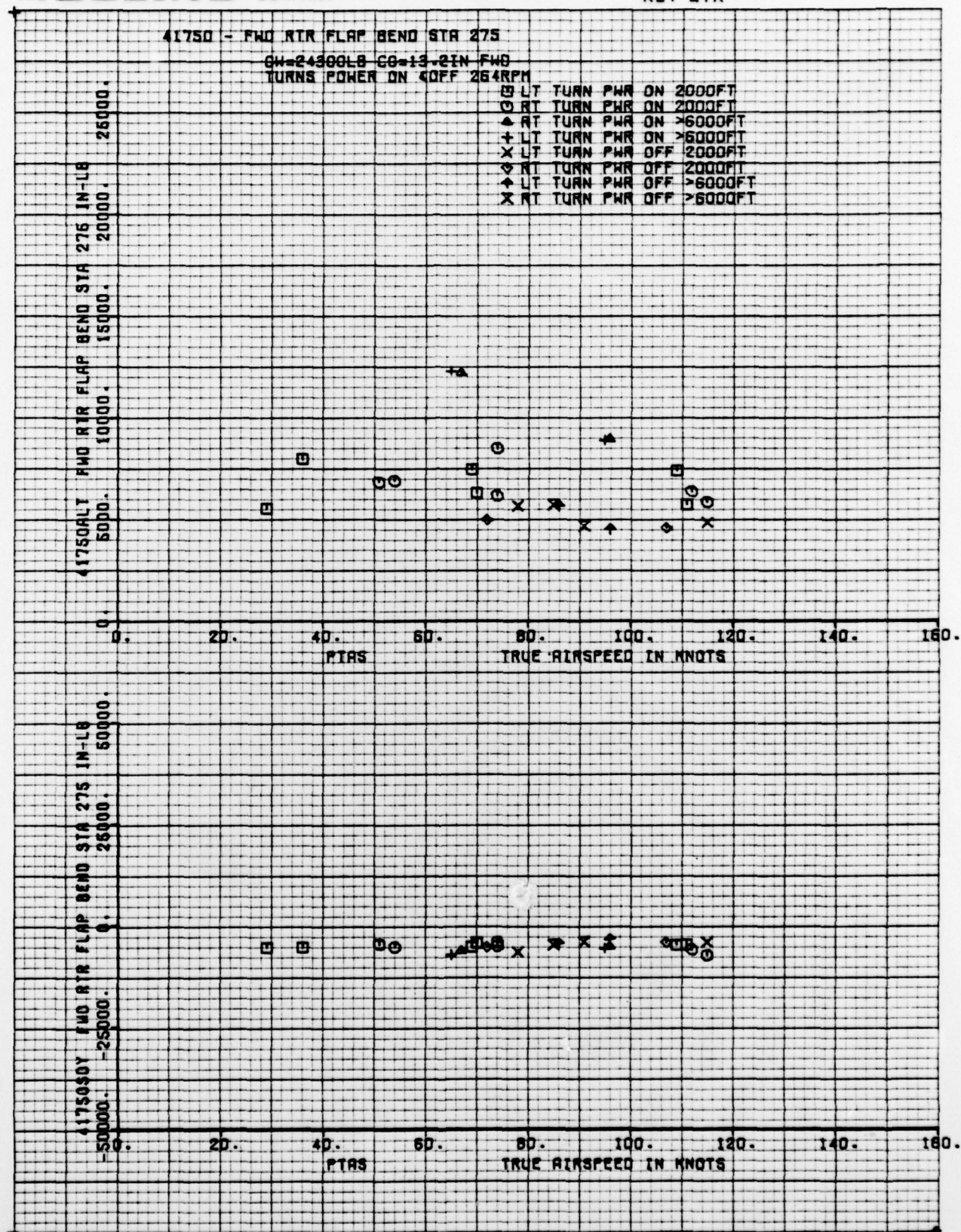
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FORM 82300 (10/71)



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FORM 52300 (10/71)

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THE **BOEING** COMPANY

41750 - FWD RTR FLAP BEND STA 275

GW=24300LB CG=13.2IN FWD

CONTROL REV. POWER ON 264RPM

- LAT CONTROL REV 2000FT
- LONG CONTROL REV 2000FT
- ▲ DIR CONTROL REV 2000FT
- + LAT CONTROL REV >6000FT
- × LONG CONTROL REV >6000FT
- ◇ DIR CONTROL REV >6000FT

41750ALT FWD RTR FLAP BEND STA 275 IN-LB
26000.
20000.
15000.
10000.
5000.
0.

0.

20.

40.

60.

80.

100.

120.

140.

160.

PTAS

TRUE AIRSPEED IN KNOTS

4175050Y FWD RTR FLAP BEND STA 275 IN-LB
50000.
25000.
0.
-25000.
-50000.

0.

20.

40.

60.

80.

100.

120.

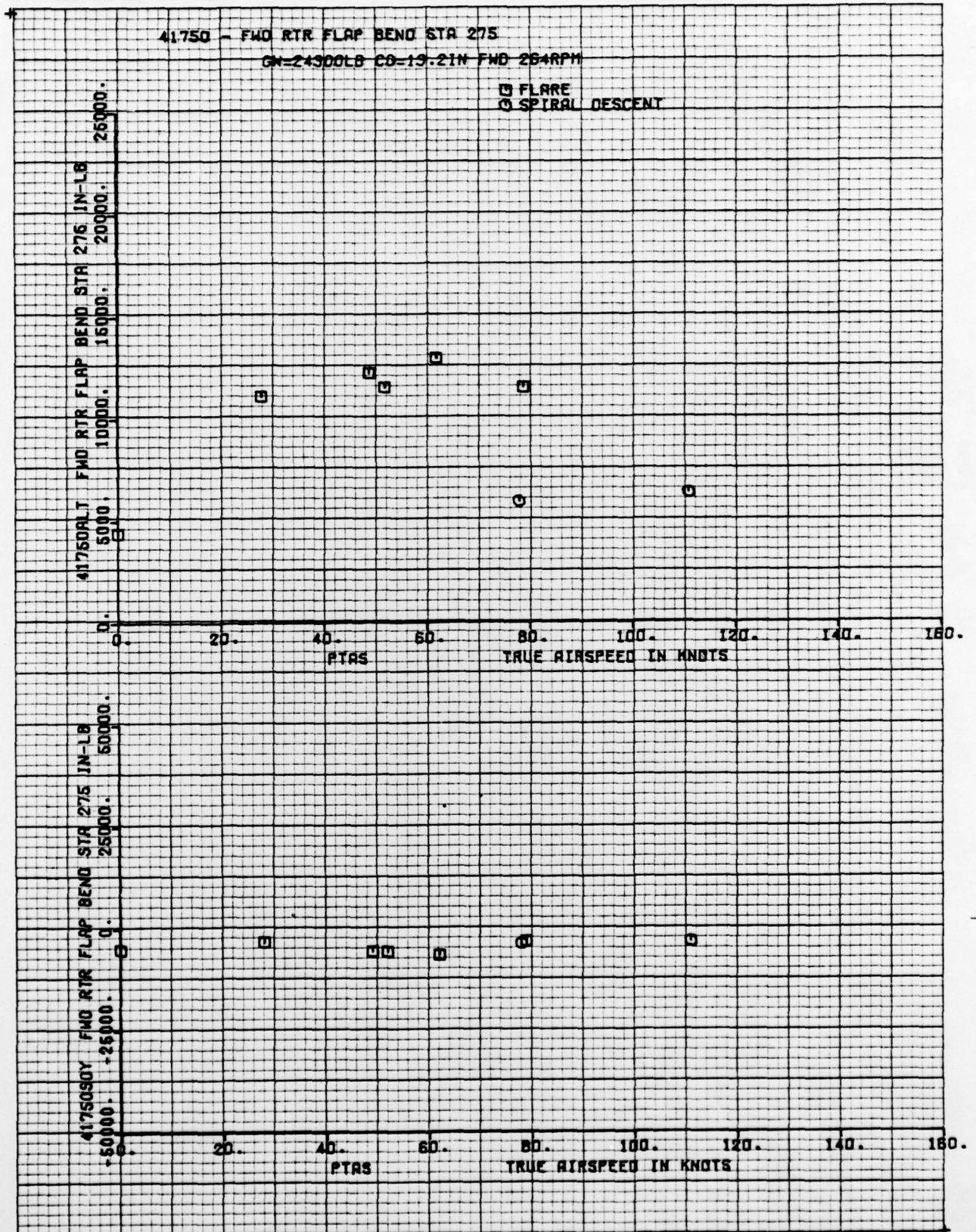
140.

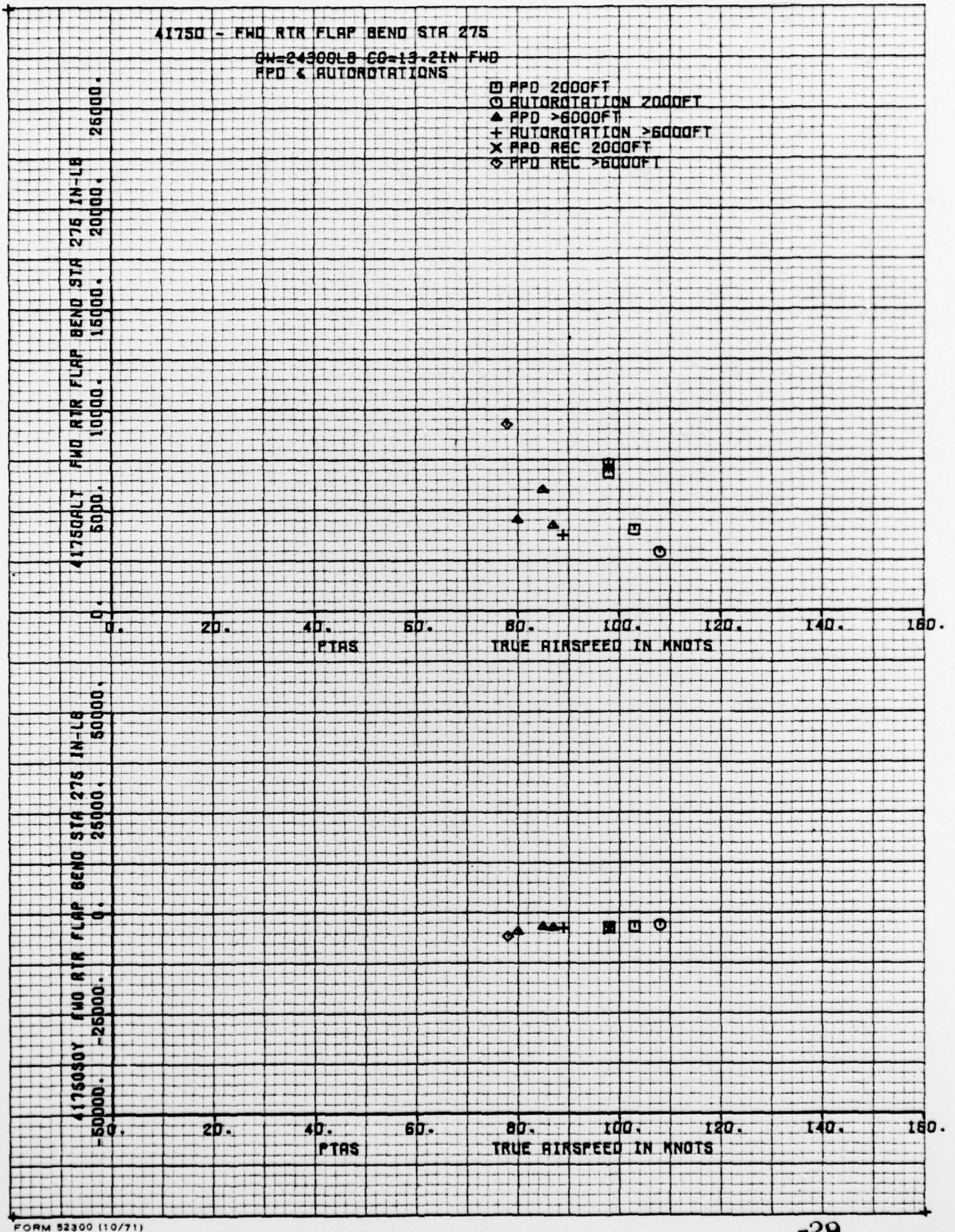
160.

PTAS

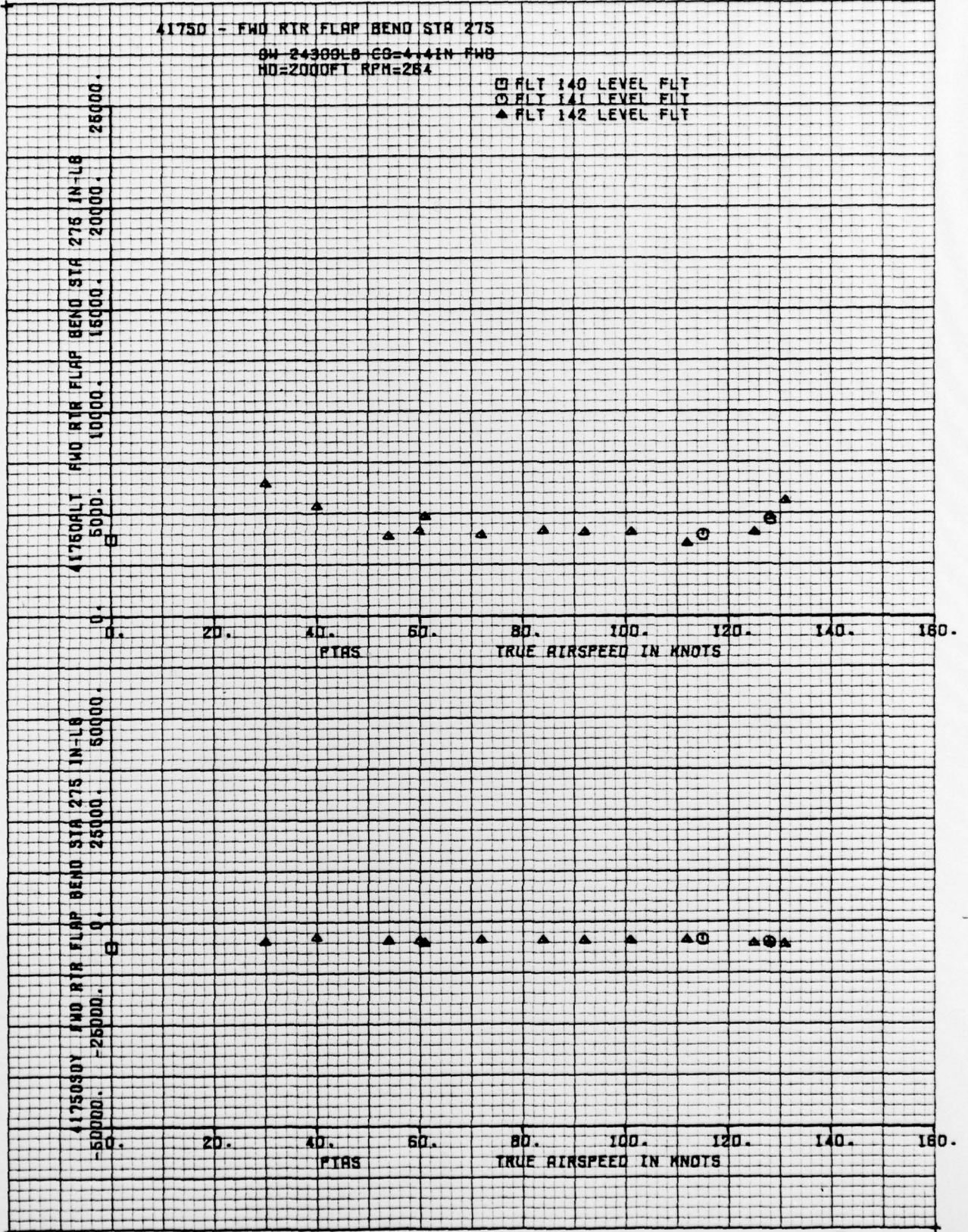
TRUE AIRSPEED IN KNOTS

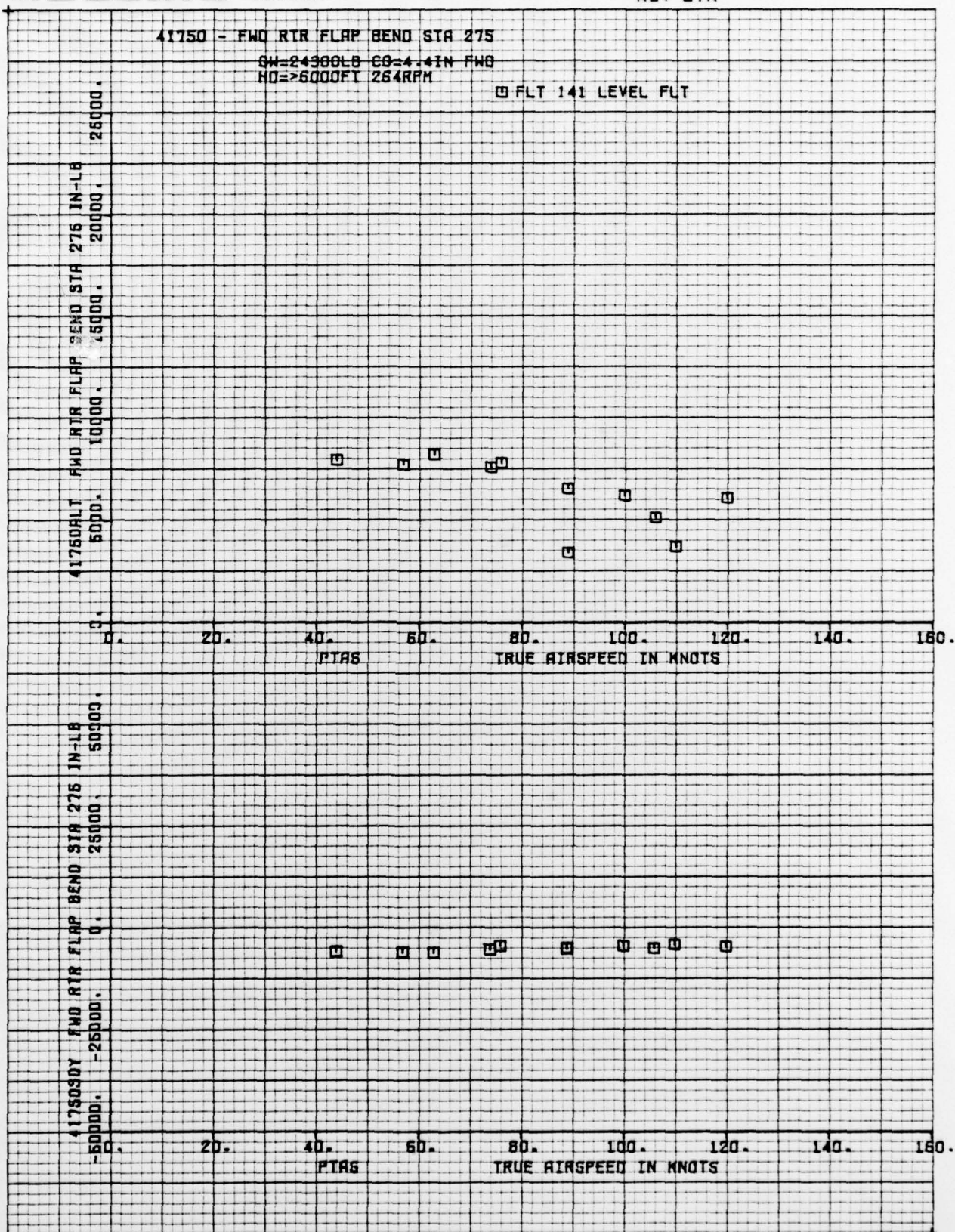
THE **BOEING** COMPANY



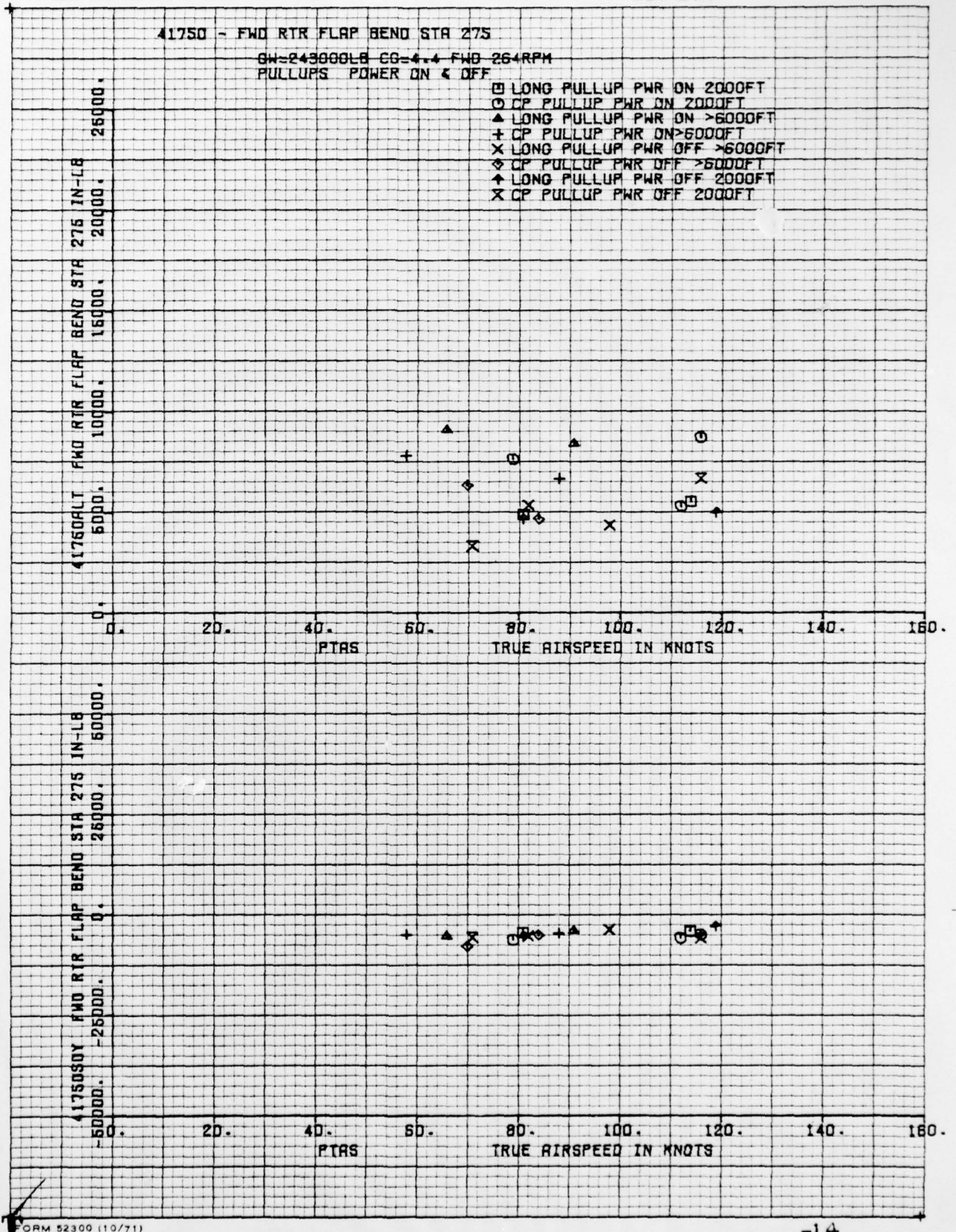
THE **BOEING** COMPANY

THE **BOEING** COMPANY



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FORM 52300 (10/71)

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41750 - FWD RTR FLAP BEND STA 275

GW=24300LB CG=4.4 FWD

POWER ON & OFF TURNS 264RPM

□ LT TURN PWR ON 2000FT
 ○ RT TURN PWR ON 2000FT
 ▲ LT TURN PWR ON >6000FT
 + RT TURN PWR ON >6000FT
 X LT TURN PWR OFF 2000FT
 ◇ RT TURN PWR OFF 2000FT
 ◆ RT TURN PWR OFF >6000FT
 X LT TURN PWR OFF >6000FT

41750ALY FWD RTR FLAP BEND STA 275 IN-LB

25000.
20000.
15000.
10000.
5000.
0.

41750S0Y FWD RTR FLAP BEND STA 275 IN-LB

50000.
25000.
0.
-25000.
-50000.

0.

20.

40.

60.

80.

100.

120.

140.

160.

PTAS

TRUE AIRSPEED IN KNOTS

0.

20.

40.

60.

80.

100.

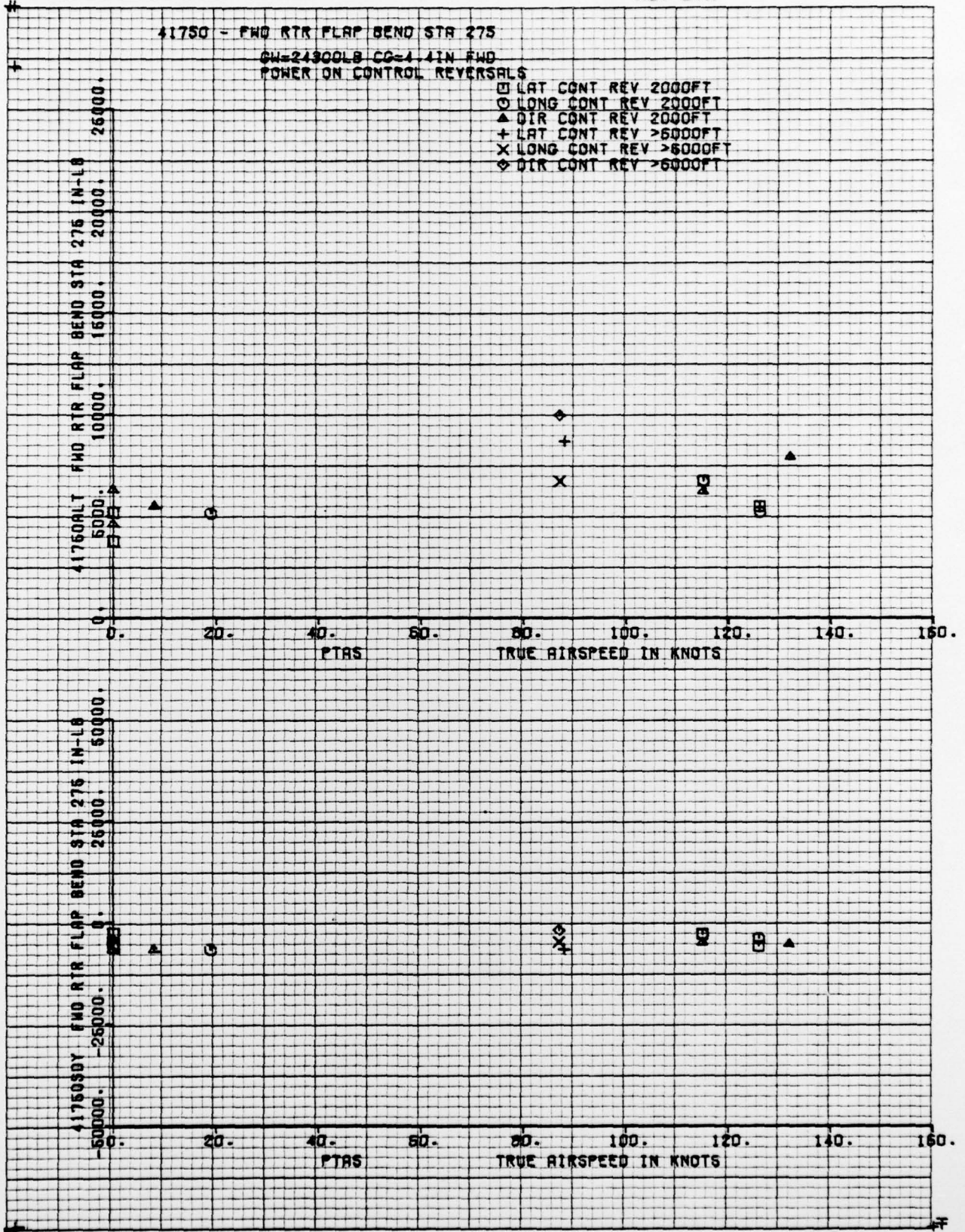
120.

140.

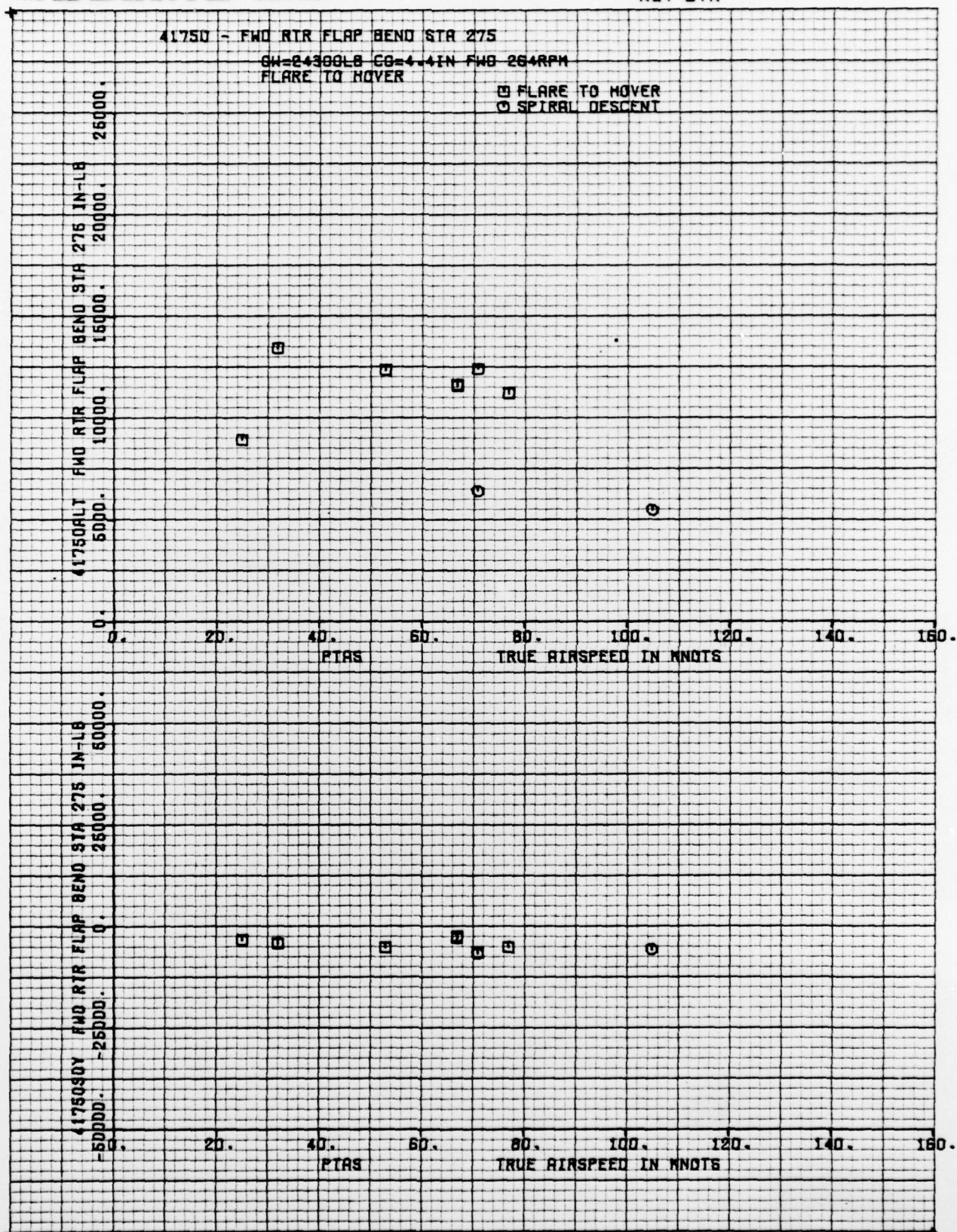
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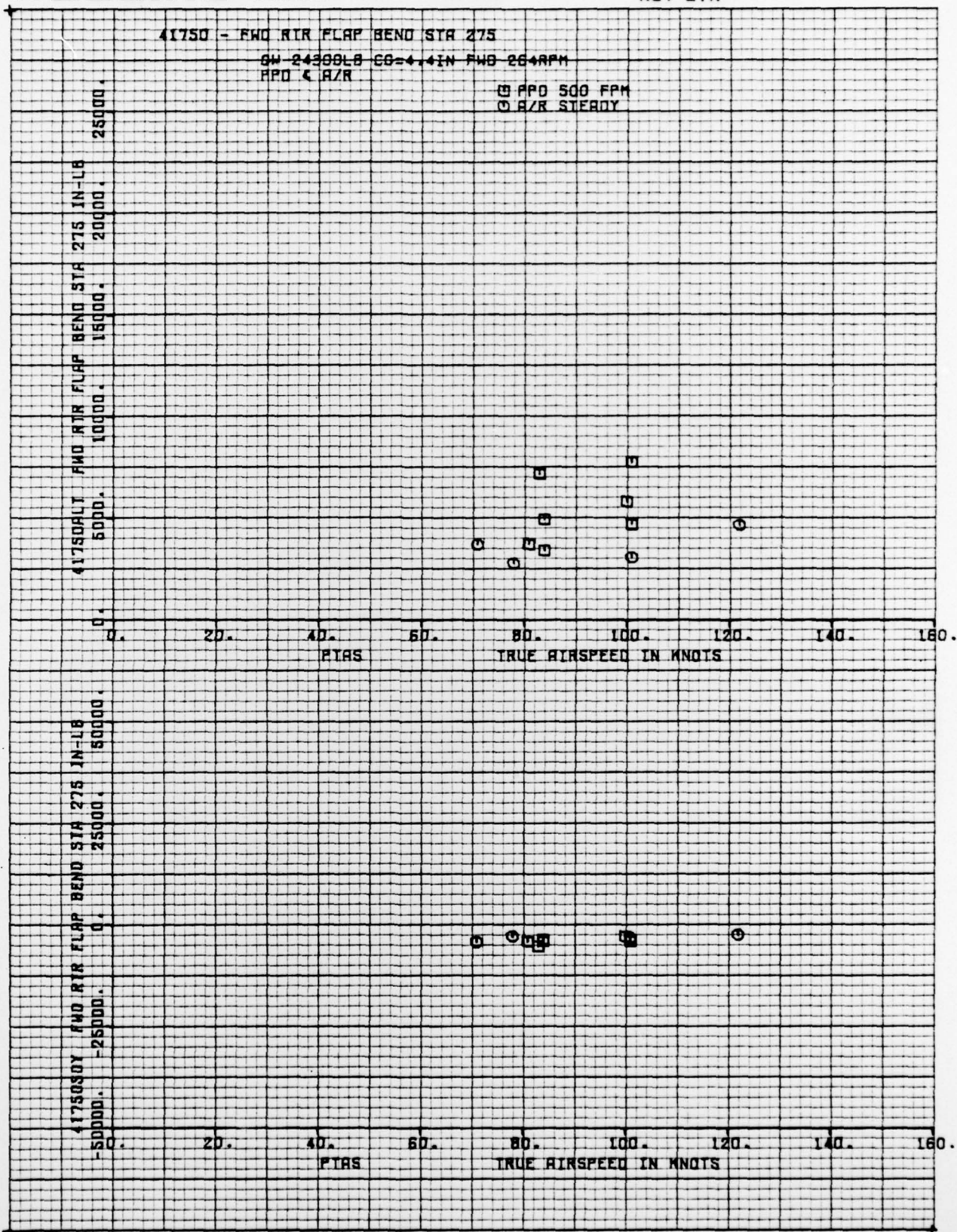
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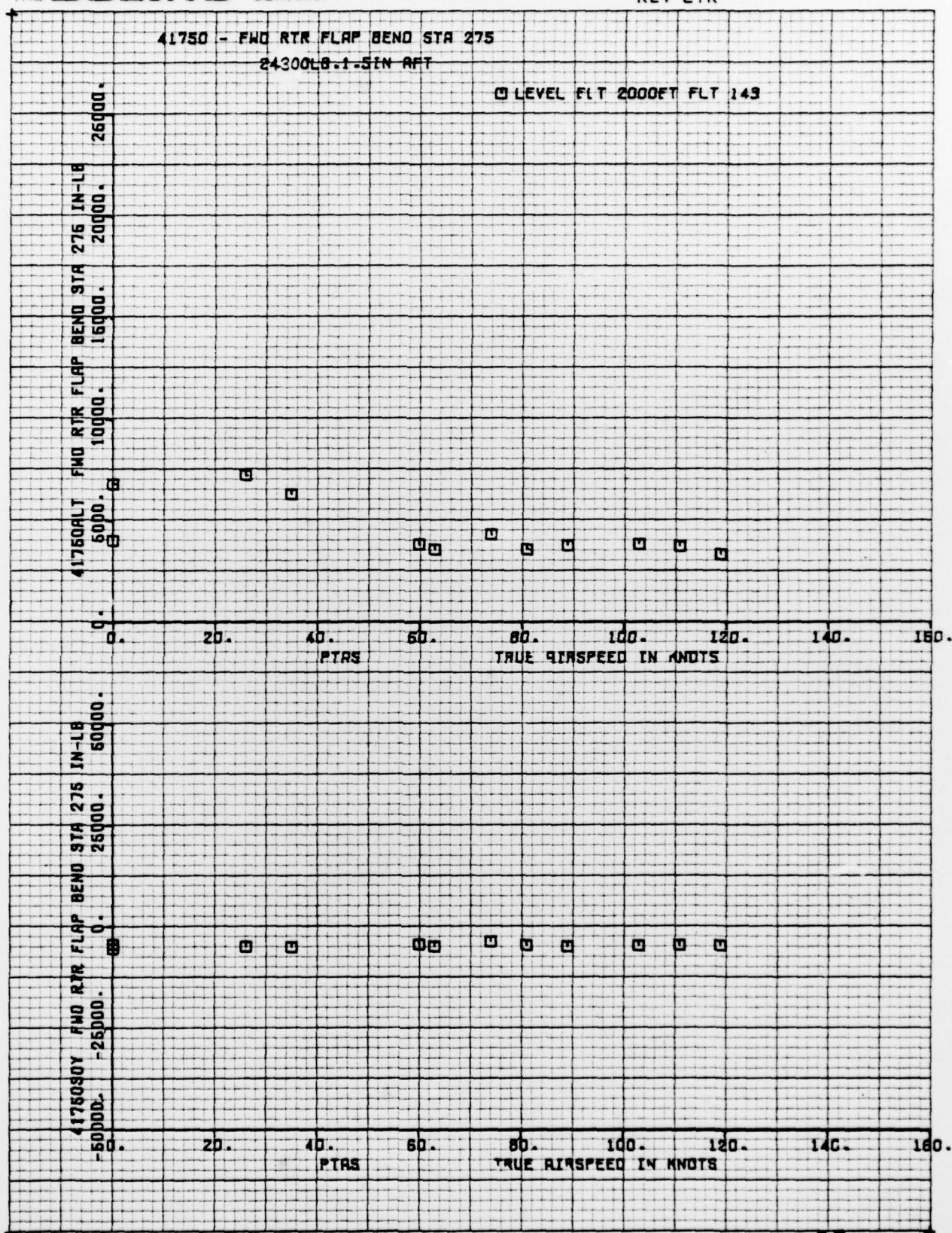
TRUE AIRSPEED IN KNOTS

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FORM 52300 (10/71)

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